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THE COSMIC CYCLE

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The
COSMIC CYCLE

BY
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PREFACE

CAN THIS BE TRUE?

The origin and the end of the world have been the subject of speculation since the beginning of thought. For untold ages man had no correct ideas about the universe in which he lived, and which he thought to be his private domain, limited in area and laid out for his special benefit. Slowly the astronomers, with their telescopes and other devices, made man conscious that he was only a worm crawling among infinities.

Still the old questions arise among the new facts. Whence and whither? The atom is revealed as a cosmos—may not the cosmos be an atom? Is there a plan? Is there a purpose? How did it all begin? What will be the last scene?

The author of this book and the originator of the theory it presents have boldly set themselves in opposition to some of our most cherished beliefs. There is the Milky Way, spanning the sky with its arch of light. This we have always viewed as a cloud of stars, so far distant as to become a mere haze of light. Now we are told it is a huge reservoir of ice, close to our solar system, feeding our sun and supplying the earth with water, causing the sun-spots, the corona, the zodiacal light, and other phenomena that still puzzle the astronomers.

There is our moon—some planets have families of moons. We have always viewed the moon as the child of the planet it moves around. Now we are told that the moon is a stranger, the prisoner of the planet —that instead of being torn from the planet's body it will ultimately fall upon the planet and cause a cosmic catastrophe.

Incidentally there are delightful speculations about the Ice Ages, about the universal flood of Noah and Satyavrata, about the lost Atlantis and many other things. These speculations are delightful because they concern mysterious menaces afar off. If they were to happen tomorrow or next week, they would cause much worry instead of wonderment.

To be told that our solar system, which is so cosy despite some earthquakes and tidal waves, was shot out of a vast cosmic cannon and will some day freeze to death is not a consoling prospect. But meanwhile, to pass the ages as interestingly as possible, let us look into the craters of the moon, at the ring of Saturn and the belt of Jupiter, at the canals of Mars and the other curious features of our sister planets, and rejoice that Dies Irae did not arrive before we had time to read this fascinating book.

George Seibel.

FOREWORD

THE interest of the general public in matters astronomical has greatly increased in recent years. Strange to say, the cause for this can largely be traced to one of the most abstract treatments of natural phenomena, namely the Einstein theory. The many publications about and around this theory, especially the writings of such eminent savants as Eddington, Jeans, and others, aiming to bring astronomy nearer to the understanding of the non-mathematical friend of natural science, have stimulated interest in the mechanics of our universe, its inception, its operation, its destiny.

Hoerbiger's theory should therefore appeal to the practical sense of the American. It has found wide recognition in Germany, is treated in numerous books and has a magazine exclusively devoted to it. This theory, called the Glacial Cosmogony, was propounded about thirty years ago by Hanns Hoerbiger of Vienna, a mechanical engineer, who was also an ardent amateur astronomer. The whole theory is so astonishingly simple, the consequences so forceful, the explanations for almost every phenomenon on our earth and in the whole solar system so lucid, that it may now safely be said to have transcended the purely theoretic stage. Hoerbiger, being an engineer, and a renowned one, bases all his derivations and explanations on facts which can be proved and checked by physical and chemical experiment. And it is for this reason that the author believes that Hoerbiger's system will appeal especially to the American public with its keen appreciation of facts.

I have not created anything original, but have taken and translated from the excellent German sources on this subject what is necessary to prove the existence of cosmic ice and to build on this proof the structure of the solar system and of our universe. In the light of this theory the geological ages of our earth will appear as a logical consequence of cosmic happenings.

The main work consulted and in part translated from the German is: "Ice, a World-Building Material," by Dr. Ing. Heinrich Voight. Translations from Valier, "Der Sterne Bahn und Wesen," and "Weltwenden," by Hanns Fischer, and other works mentioned in the Bibliography have also been inserted. The author wishes to express his thanks to these gentlemen and to the publishing house of R. Voigtlander, Leipzig, for their kind permission to use their books and plates. He also wishes to thank Dr. Caspar Koch for his invaluable help in the revision of the manuscript, and Mr. Max Hartenheim for his technical assistance.

There is only one authority for the statements in this book and that is the book "Glazial Kosmogonie," by Hoerbiger-Fauth.

Pittsburgh, Pa.

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INTRODUCTION

You are going with me on a strange and mysterious journey, such a journey as you have never before taken, and you shall learn things about the universe and about our home-star, the Earth, which will amaze you. We will explore together entirely new paths,—paths which shall lead to knowledge and which, although their beginning and general direction is well known, have never before been followed all their length to their ending.

Many people ponder about our life on this whirling ball, about its origin, its meaning, its ultimate fate. Nobody has ever solved the riddle of life, but we know that it is bound up with the fate of this spinning ball, one of nine planets circling around the sun, and that, in order to come nearer to a solution, we must know all we can learn about this solar system of ours, about its origin, its laws, and its probable end.

We shall see in the following pages the solar system starting on its journey through space, shot like a projectile from a gigantic cosmic cannon, pursuing its course, after the explosion which sent it forth, as a primordial glowing chaos, whirling and regulating itself into an orderly system, such as it is today. We shall watch the birth of the planets, follow the motions of the moons, and see their fateful capture by larger planets and their death march. We shall see the terrible cataclysms caused by the falling moons, the great death on earth, floods which reach the highest mountains and we shall see the Glacial Periods creeping over the earth, covering all life with a mantle of ice.

We shall make the startling discovery that the beautiful Milky Way, which spans our sky like a shimmering luminous ring, is composed of ice bodies and that it is part of our solar system and not untold light years away. The Milky Way—a huge reservoir of ice, feeding the sun, supplying the earth with water, making life possible, causing sun spots, corona, and protuberances on the sun, and hailstorms, tornadoes, zodiacal light and northern lights on earth.

We shall also visit the planets on our fascinating journey. Will we find life there; is Mars or Venus inhabited? Alas, shoreless ice oceans and eternal death await us. We shall peer into the great craters of the moon, our present moon, but not our first nor our last one, and we shall watch its death struggle when it approaches the earth to plunge finally upon it.

The ring of Saturn, the most beautiful of all celestial objects, and the bands of Jupiter shall have our attention, and we shall stop for a while on Mars, the red star, to study the mysterious canals as they come and go on its surface.

Ancient legends and revelations will become clear, the riddle of the Lost Atlantis will be solved, and the great flood, of which the Bible tells, will become a fact and a threat. And now let us start on our journey, but I shall ask you, as the only requisite, to clear your mind entirely of all earthly conceptions of space and time, for we shall not deal with matters of the earth so much as with matters of the universe, and we must think from now on mostly in cosmic figures and cosmic dimensions.

PART I

THE GENESIS OF THE SOLAR SYSTEM

THE COSMIC CYCLE

CHAPTER I

IN THE BEGINNING

IN THE beginning there was Heat and Cold, and from the contrasting action of these two forces on matter all movement and power in the universe is derived, and with it begins all creation.

A new cosmogony, a new story of the beginning and structure of our universe, bold, original and grandiose in its conception, has come from Austria, conceived by an engineer, not an astronomer or philosopher, but an engineer, who has presented it to the world with proofs, calculations and unique mechanical drawings, and for over twenty-five years waited and worked for recognition by the world of science.

There seem to be three stages through which startling scientific theories must pass. During the first stage they are ridiculed and passed over as fantastical, then they are attacked bitterly and controversies rage in the world of science, finally, having proved their value and reasonableness they are adopted, and the first two stages are more or less forgotten.

The Glacial Cosmogony of Hoerbiger seems now to be in the second stage, although one can still hear voices which condemn it as pure fantasy and far-fetched impossibility. The new Glacial Cosmogony of Hanns Hoerbiger, of Vienna, is not a vague and fantastic theory built on vague premises; it does not depend on the acceptance of nebulous gas clouds which contrary to all laws and habits of gas, as known to us, are supposed to contract and develop heat, but it deals with a few axiomatic, well-known and recognized laws, and erects on these its magnificent structure of the creation. It explains fully and reasonably some of the most perplexing riddles of the universe, the structure and motion of the sun and the planets, the question of extra-terraneous life, the sudden destructive appearances of tornadoes and hailstorms, the weather on earth, the geological epochs, the origin of coal, oil, and salt, the glacial periods in the history of our planet, the stories of the great floods, a world memory preserved and told in over sixty legends and myths, and finally the future of our universe, according to immutable natural laws.

The fact is of importance that Hanns Hoerbiger is not a professional astronomer, but an engineer who took up astronomical observations, especially of the moon, as an amateur. In consequence his work bears the stamp of the technically schooled thinker, who builds on facts and observations rather than on hypothetical calculations and whose thought-structures have a concrete physical foundation strong enough to support and carry the bold superstructure.

The old cosmogonies deduce the formation of the heavenly bodies from gas balls, which first appear as nebulæ of incredible thinness, and then through inner forces contract and become heated until an incandescent sun is created by steadily increasing temperature. But this is against all our terrestrial experience of the behaviour of gases and can never be proven correct or even feasible. Hoerbiger opposes such hypothetical speculations, which cannot be demonstrated experimentally, as spectral analysis, the only means at our disposal is not sufficient to prove them. Instead of this he wants to penetrate the universe from the earth as a firm starting point, use our moon as the first rung of the ladder which shall reach to the planets and to the sun, and from there dare the flight into the cosmos, but only when the starting point has been found to be a secure anchorage.

About forty years ago, when he began to study the moon with the help of a small telescope, it occurred to him that the surface of the moon consists of ice. All mountains and craters and also the dark areas, called Mare or seas, must be ice structures. And from this conviction sprang the question: How can ice in such quantities originate on the moon? And then the further question: Of what do the surfaces of the planets consist, and if they also should consist of ice, how did it get there, and, furthermore, how can ice exist in cosmic space at all?

CHAPTER II

The Glacial Cosmogony

I SHALL take you out under the wide, star-lit sky and its myriad points of light. For untold ages men have gazed thus into the heavens and some have thought deeply about it. They saw that nearly all of these stars always kept their relative positions, but that the entire sky revolved around its axis every night in slow, majestic grandeur; they saw that a few bright stars seemed to have no part in this slow rotation, but that they had a path of their own, wandering across the sky and perceptibly changing their position. This was observed in very ancient times and keen human brains speculated about it. Naturally the most obvious explanation suggested itself. The earth was surely the only steady point in this whirling universe, it was in the center of all things and everything else turned around it. The sun made its daily journey across the sky from East to West; the moon wandered quietly at night in the same direction; the entire system was delightfully simple so far.

But doubts crept in as to the simplicity of things. The spherical form of the earth was suspected a long time ago. Then the slow march of the firmament of stars was doubted—a rotation of the round earth around its axis would have the same effect. And finally the gigantic thought was voiced that the firm, rigid, and stable earth itself was not really standing still, that it was the sun which was standing still and that the earth and the planets revolved around it.

Astronomers, scientists, philosophers thought about the mechanics of the solar system, they speculated about its origin, and various theories, as to its origin, called cosmogonies were brought forward. The latest one of them we are now considering.

Astronomical science at the present time adheres to the Kant-Laplace Cosmogony. Let us take a look at it and consider it briefly. The great philosopher Kant, one of the deepest and most logical thinkers who ever lived, but not an astronomer or scientist, formulated this theory of the origin of our solar system and the French scientist Laplace augmented and corrected it. Kant begins with a primordial, glowing nebula filling an immense area in cosmic space; Laplace assumes this nebula to be in rotation. This whirling gas cloud condenses in time through contact with the icy temperature of space and in contracting throws off rings, which break and roll themselves up like tapes, and thus form globes of various sizes, all rotating in the same plane and in the same direction as the original nebula. These globes then condense into solid bodies and become the planets.

This, in very short words, is the Kant-Laplace Cosmogony, still largely adhered to by astronomers, although assailed by serious doubts and objections. No human being has ever seen gases behave in such an extraordinary manner.

But this hypothesis held its own without serious objection until the Swedish chemist Arrhenius declared that the primordial nebulæ were an impossibility. He did not know that Hanns Hoerbiger before him asserted the same thing and had constructed a new cosmogony, the Glacial Cosmogony, which we are considering here. Arrhenius says that the sudden appearance of a new star, a so-called nova, is a sign that two dark stars have collided, not head-on but slanting, and that a new star is the result which the collision has put in rapid rotation. The collision has opened huge wounds on both stars and the molten star-substance pours out into space and forms two arms, which, when seen from a cosmic distance, presents the picture of a two-armed spiral nebula.

Another result of the rapid rotation is the flattening of the whole into the shape of a lens. The far-flung edges of the lens cool rapidly in the icy cold of space, whilst the center star remains incandescent. This nebula attracts cosmic dust and meteors and even small cosmic bodies. These enlarge constantly and form star clusters of many suns which go through the usual life experience of suns, become incandescent, red and finally black and wander thus as cold bodies in space for other collisions and repetitions of the same process.

This is a great step forward from the nebular hypothesis of Kant and Laplace, but there is a fatal flaw. It can easily be demonstrated that two approaching stars will never collide in this manner. There is not enough time to deflect their paths sufficiently, and that two bodies should be headed to a direct head-on collision is practically an impossibility. They will neither meet head-on nor slantingly, but will merely deflect one another's path into a different direction and pass each other.

A capture can take place only, if a smaller star gets into the gravitational field of a much larger one; then it will become a satellite of the latter. But no nebula will ever originate in this way. Neither will this occur if the smaller star penetrates into the larger one. We see in that case a "nova" with the well-known light-curve, which rises suddenly, because light is emitted at the place of lesion, but quickly falls again until the star appears of the same magnitude as before. This has been observed in the heavens, as in the case of Nova Persei. This is the birth of a new star, but not of a nebula.

There are still other objections, cosmo-technical objections to the Arrhenius hypothesis, but we need not enter into the matter any further. The problem remains unsolved, the path leads to no solution.

The Glacial Cosmogony dispenses with all this. It deals with materials and occurrences which have been actually observed and can be checked.

The foundation on which it is built is knowledge of actual happenings in the cosmos and technical experience. Three simple premises form the basis on which Hoerbiger erects his colossal structure. The first is: there is no empty space, no vacuum, anywhere; the second: no form of energy can be transmitted through space without loss; the third: wherever anything happens, a contrast is the origin of the happening.

The first deductions from these premises are: every movement meets with resistance, as there is no empty space, and must finally cease, if it receives no new impulses; the extent of every form of energy is finite, i.e., limited, and that some matter must exist in a universe of glowing stars which forms a contrast to their material; and this contrast forms the origin of all that is going on.

These premises of Hoerbiger's need really no special proof, for they are all based directly on experience. We know of the existence of occupied space, for all bodies are just that. But whether there exists completely vacant space, however small, we do not know. At any rate no one has ever succeeded in producing a complete vacuum. The conception of "empty space" in natural science is merely an abstraction, a negation of occupied space. And yet natural science builds the laws of cosmic movements entirely upon the existence of empty space, and on that premise stand, or with it fall, all calculations of the real motions of stars.

Our experience in the transmission of energy teaches us that every form of energy suffers a "loss of transmission," which means that in transmission a certain amount of that energy is transformed into other forms of energy. Our entire technical science is constantly engaged in finding a way to check these losses, which are in most cases very undesirable. Transmission of power without loss has never been accomplished. No engineer has ever succeeded in doing this, and yet it is accomplished by orthodox academicians with the stroke of a pen. They transmit, by their formulas, energy without loss into the infinite space of the cosmos.

It can be claimed only by ignoring all experience that cosmic space is empty and that energy can be transmitted through it indefinitely without loss; only by intentionally setting aside all experience can it be maintained that the attraction of the heavenly bodies extends far into the realms of the fixed stars. And yet we find these very claims still advanced as the sacred doctrines of academically certified science.

The third premise of the Glacial Cosmogony has also been proved. Wherever anything happens, there must be a contrast; above and below, hot and cold, heavy and light, fast and slow, for that lies in the nature of matter. Otherwise there would be no motion. Hoerbiger here simply follows an experience, which our senses constantly perceive a thousandfold around us, and he is particularly anxious to secure for his theory the greatest, mightiest, and most violent of contrasts known to us from experience, the contrast between extreme heat and extreme cold, as the basis and starting point of all happenings.

We can observe what happens when ice and glowing matter meet by dipping an ice block or a porous, water-soaked, and frozen brick into a vessel filled with glowing liquid furnace slag. But we cannot make a laboratory experiment to determine how a ball of pure gas will behave.

It is well known that the stars have motions of their own, which are quite considerable, although not noticed by us in the short space of a hundred years during which they have been under observation. The star nearest to us, our sun, moves through space in the direction of the constellations of Lyra and Hercules at the rate of 12.5 miles a second, and other stars have motions considerably faster. The cause of these motions was considered to be the law of gravitation which was supposed to attract them to each other and thus keep them in perpetual motion. Newton's law of gravitation was considered a natural law of universal application and valid for unlimited distances. But a number of observations have recently undermined this belief. Newton's law was found to be not a natural law but an empirical law, valid and exact enough for cases in our proximity but by no means so for cosmic distances.

When Newton formulated his law and Kant checked it, the outer planets, Neptune, Uranus, and quite recently Pluto, were unknown, and the movements of the stars had not been discovered; it may be stated with certainty that these two clear thinkers, had they known of these discoveries, would not have attributed to the law a cosmic validity, but would have recognized its terrestrial limitation. This does not in the least diminish the fame of Newton and Kant, although the next generation may dispense altogether with the theory of gravitational force and discover different causes for the phenomena now attributed to it. At present, however, we are still compelled to use it as a working hypothesis. The range of gravitation depends, of course, entirely upon the mass of the star. If the mass is greater than that of the sun, the gravitational influence will correspondingly extend farther.

That a fact which holds good for short distances on earth is not applicable to greater ones in the cosmos can be illustrated by a well-known example. If you lay out and measure a distance of a mile on our globe the result will be apparently a straight line whilst a longer distance measured in the same direction gives a curved line on account of the spherical shape of the earth.

On a clear, starry night you look up into the heavens and apparently see myriads of points of light. In truth you see only a few thousand with your naked eye, but the artificial eye of the astronomer in his dome on the hill over there and the photographic plate see millions of these mathematical points of light. Each one of them is a sun, like our own familiar sun, perhaps with a convoy of faithful planets circling around it, and perhaps giving light and heat and life like our own.

But there are suns among those points of light which are many thousand times the size of our own sun; they are giant suns with a mass which exceeds hundreds of millions of times the mass of our sun. The researches of two astronomers, Herzsprung and Schwarzschild, well-known among scientists, have proved the existence of such giants in space without a doubt.[1] But how could they determine that, when there is no direct way to measure the diameter of a star which is so far away that we can perceive it only as a point of light? I cannot take you into the realms of higher mathematics and astronomical calculations; this would result merely in your laying this book aside and saying: life is too short, we leave that to astronomers and take their word for it. But I can give you a brief glimpse of the method employed without imposing on your patience.

We know the distance of a number of stars and these distances are so vast that a huge array of figures would be necessary to express them in miles. Therefore the astronomer uses as a unit of measurement the term "light year," that means not a unit of time, but of distance, viz. the distance which light travels in one year, and light is the fastest thing known in the universe and travels at a speed of about 180,000 miles a second. If you now take your pencil and figure how many seconds are in a year and multiply this number by 180,000 you get approximately the distance of a light year in miles. You will find that a light year is a distance of 5.65 trillions of miles. Stop for a moment and try to realize this figure dimly, there is no way for the human mind to conceive it, and then you get an idea of the distances of stars when you are told that the very bright, brilliant point up there in the sky which is called Sirius is eight and one-half light years away, or that another one called Vega is thirty-nine light years distant from our earth.

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[1] It is interesting to hear that Hoerbiger demanded theoretically the existence of giant suns in the year 1897, long before the hypothesis of Herzsprung was published. In 1911 Professor Riem declared: "The existence of such giant suns is a hypothesis which is not supported by any observation." This "hypothesis" is a fact which is to be found as such in all larger astronomical works, although the name of Hoerbiger is not mentioned.

And now we return to our task of finding out how these distances are determined. We light a candle in a darkened room and place it before a white screen at a distance of one yard. The amount of light thrown on the screen at this distance can be measured accurately by a light-meter. Now we move our candle to a distance of two yards from the screen and measure again the amount of light it throws on the screen. It is not one-half the amount at double the distance, but only one-fourth of this amount, and at three yards it gives only one-ninth the amount. The scientist says that light diminishes with the square of the distance and calls this a law of nature, because it has been found universally true.

If we now light a strong lamp, besides our candle, and by experiment find that our screen is illuminated by the lamp at a distance of three yards exactly as much as by our candle, held only one yard away, we conclude at once that the lamp is nine times as strong a source of light as the candle, assuming, of course, that the light is pure white in both cases.

You have seen a piece of iron getting heated, perhaps in the furnace of a smithy. It first gets red and then glows in a white heat before it melts; and when you let it cool, it will again become red, before the emission of light ceases completely. This is a well-known process and we know, of course, that the red light is weaker than the white. The telescope of the astronomer shows numerous stars in the sky which show a clear white light like Sirius, Vega, and many others, and a great many which glow with a distinct red glare, as Arcturus and Aldebaran, and we come to the conclusion that the white stars are the hottest, while the red stars are either on the way to incandescence or have passed their hottest state and are cooling off. A red star will always emit less light than a white star of the same size.

We now compare two stars equally distant in light years, of which the one glows white and the other red. If we find by a delicate measurement known to astronomical science, that the amounts of red light and white light from the two stars are equal, we conclude naturally that the magnitude of the red star must be so much greater than the white star, as red light is weaker than white. This is all self-evident.

If, furthermore, we know that the white star is, let us say, six times as large as our sun, we can then compute a probable size of the red star which may be several hundred times that of the sun. But all these difficult calculations and comparisons are just beginning to engage astronomical science and we shall in the future, without doubt, hear of larger giant stars.

Let us at this place consider in general the development and growth of stars. We do not know at the present time how the first elements and agglomerations of elements developed from primeval atoms, but we are acquainted with a physical law which teaches us that from the collisions of small bodies larger bodies are formed and they become still larger, as their mass is added to by further collisions. Another physical law teaches us that such an increase in mass carries with it an increase in temperature, at first a moderate increase, but constantly growing if the force of gravitation attracts more and more material to combine with the original mass. Most of these attracted bodies fall in a direct, straight path and change their velocity to heat at the moment of impact. Large bodies, however, approach and fall into the central body in a tangential (slanting) direction, without great force of impact; but such a slanting blow of a large body will result in starting the larger body to rotate around its axis, as our earth is now rotating around its axis, or if such a rotation was already in existence, the slanting blow will accelerate it. Hoerbiger sums up the difference between the two processes in a terse sentence and says: Absorption of large bodies enlarges, of small bodies creates heat.

The law of gravitation, about which we had an argument before, teaches that the larger the mass of a body is the farther extends its gravitational field, and that results in our case in a further increase of the shower of small bodies, attracted from outer space. It is now obvious that it is only a question of time, until these constant bombardments of small bodies will have generated an incandescent heat and enveloped the central body with glowing gas, which surrounds the star like the photosphere surrounds our sun.

I intentionally avoided the appellation of "meteors" for these small projectiles. They need not be fragments of a cosmic explosion, wandering around in space, since there is sufficient material in space for the generation of such primordial structures. Our primordial sun, which we are theoretically constructing here, need not be a special creation, because new combinations may originate anywhere in space. We can safely take it for granted that a large body will gradually increase by drawing smaller bodies into its gravitational field and will concentrate a veritable cosmic drum fire of smaller bodies upon its surface. Should this stop for any reason or should the balance between radiation of heat and acquisition of new heating material be disturbed in favor of the first, then the cooling process of the star begins, indicated by a recession of the height of the photosphere and a reduction of the temperature, which can be observed by the spectrum of the star. The star then glows with a reddish light.

We know that these red stars are not as hot as white stars, but while the state of incandescence occurs only once in the life of a sun, the red aspect may be observed in two stages, once in the beginning, when the heating process has just started, and then in the old age of the sun, when its temperature is falling. This we have observed in the iron, in the smithy furnace.

There is no certain way of telling through which of the two red stages a star under observation is passing, even spectroscopy, that marvellous science, will not tell us that, just as it cannot tell us the distance of a cosmic body. But it determines its movement, whether a star is approaching us or receding from our system into the vastness of space.

If you observe a small reddish star, which is developing at a small cosmic distance into a white star, you will get the same impression, as if you were observing a distant and large star which is dying, and you can draw a conclusion as to which of the two ages the star is passing through only by an actual measurement of the distance. But we need not go into further details; we merely wanted to make sure that stars increase in size, some of them growing into gigantic suns, and that they are subject to increases and decreases in temperature.

I have now made you acquainted with two premises of the Glacial Cosmogony, the limitation of the law of gravitation and the existence of giant suns. We can add a third one, the supposition that the gas hydrogen must exist in cosmic space in enormous quantities.

Hydrogen is the lightest gas in our atmosphere and as such it has been observed to rise to a height where it actually escapes the gravitational force of the earth and cannot be recovered. We also observe during an eclipse of the sun a magnificent sight, a wreath of rays surrounding the sun, the corona, and from it shoot out the so-called corona-rays, reaching immense heights, until they become invisible to our sight, although they may extend beyond the orbit of the earth.

We can also observe on the sun, with appropriate instruments, the protuberances which have been found to consist of glowing hydrogen and measured to rise to a height of 300,000 miles. So far we can still see them as incandescent gas clouds; then they become invisible, because they cool and expand rapidly, leaving the sun with enormous speed, aided by the pressure of light. We may logically suppose that of all these masses of hydrogen nothing returns to the sun and all of it escapes into space. The spectra of all stars show the hydrogen line, which permits the conclusion that similar phenomena take place upon them as on our sun, and that they also continuously exhale hydrogen into space. We deduce from this that the stars have a hydrogen envelope similar to the atmosphere of our sun. The entire space between the stars in the universe can therefore be rightly assumed to be filled with hydrogen in extreme attenuation and in immense quantities.

But if the stars exhale hydrogen continuously, this element must originate constantly in their incandescent mass. How is that possible? It is possible only if some compound rich in hydrogen is being dissolved in their glowing interior. Such a compound is water itself. But as water as such cannot exist in the body of the sun, we have come to the conclusion that it has been temporarily introduced from the outside, which can only happen in the form of ice, as that is the only state in which water can be present in the intense cold of outer space. There is, of course, a possibility that other hydrogen combinations might cause the same phenomenon, but as there is no reason to doubt the existence of water in the form of ice in space and as we may take for granted, because of the uniformity of matter in the universe, that the observations which we make in our own solar system hold good for other systems, we do not hesitate to attribute the hydrogen lines in the spectrum of a star to water dissolved into its constituents. If we can prove that ice exists everywhere in our solar system and can show how it originated, we shall have removed all doubts still existing as to the presence of ice in cosmic space. After these preliminaries we now approach the problem proper, which is presented by the question as to how star systems in general, and our solar system in particular, originated.

CHAPTER III

The Cosmic Explosion

You will remember that in the second chapter I formulated the three premises on which the Glacial Cosmogony is built and that the third of them was that whenever anything happens, a contrast is the origin of the happening. We begin the origin of our solar system with such a contrast, the most violent contrast known to us, the contrast between Heat and Cold.

Look up at the starry sky again, let us say, on the first of March at eight in the evening and face toward the South. In front of you, a little to the right, you will see the magnificent constellation of Orion, "with his belt of fire." The three stars of the belt point south-west to the large Aldebaran and in the opposite direction to Sirius the Dog Star; both brilliant objects in the sky. The two large stars South and North of the belt are Betelgeuse and Rigel respectively. Almost overhead and just a little to the right is the inconspicuous constellation called Columba, the Dove, although you will see no resemblance whatever to a dove. In this neighbourhood, untold eons ago, must have been the birthplace of our solar system. Our sun and all the planets and bodies belonging to the solar system are in motion through space and their flight is directed to a certain point in the heavens, the so-called apex point, located in the neighbourhood of the constellations of Lyra and Hercules. This motion is called the translatory motion of the sun, and from its direction we can trace back to the probable point of its start. The apex point, between Lyra and Hercules, you can locate best in the spring, about the first of May, when facing North you will see the two constellations almost overhead, somewhat to the right.

Somewhere near the constellation of the Dove there wandered in space a giant star with a smaller companion—a twin star system, such as is observed in various places in the heavens. We know that stars have motions of their own and our two stars may have travelled in paths which intersected some place. There is the possibility that the smaller body entered the gravitational field of the larger and then its fate was sealed, unless it moved with a speed which would make it pursue its former path again after overcoming the transient disturbance of the meeting.

Let us suppose that such speed was missing and that the smaller star was caught in the gravitational coil of the giant. A centrally directed fall, a head-on collision, is almost a thing of impossibility, but the smaller body was forced into an orbit around the larger one. It will now gradually approach the larger body during its revolutions in a spirally elliptic orbit. This is a system of twin stars.

Our giant star, or star-mother, is a gigantic sun, a sun of the size of Betelgeuse in Orion with a diameter about 300 times that of our sun. This is a ball large enough to contain the sun and the earth in its orbit circling around it. The mass of this star, since we refuse to recognize gaseous material, can be assumed to be 200 million times that of the sun. The companion star is much smaller, we may give it the size of

Arcturus in Boötes, the mass of which is estimated to be 40,000 times that of the sun. If you study the illustration you will see the respective sizes of these celestial bodies drawn to scale with the sun indicated for comparison as a barely visible dot.

The giant star-mother must, for our theory, be large enough to throw into space such a mass of material as is necessary for the structure of a whole world-island of the size of the solar system. We can readily see that an enormous amount of working material is needed, if we consider the aggregate mass of the sun, the planets, comets and planetoids and millions of dwarf stars forming the sidereal Milky Way. But of this I am going to tell you later in its proper place. We suppose the star-mother to be a glowing sun, composed of the same material as our sun and in a state of incandescence.

The companion star may also have been a glowing sun at the time of its capture, but now, just before the catastrophe, it had become a dead, cold world, just as our own companion, the moon, is. On its flight through space, through countless eons of time, it had become a frozen world, with an ice mantle thousands of miles thick. Whilst companion star to our giant, it had not been able to capture a sufficient supply of meteoric material to retain its heat, as this had been diverted by gravitational force to the much larger body. It had consequently lost its heat and became first a reddish and then a deep red star. Finally its light was entirely extinguished and as a black, ice-covered and water-soaked star it swung in its orbit around the giant sun, coming nearer and nearer. For millions of years, though not being luminous any more, it had retained a considerably higher temperature and

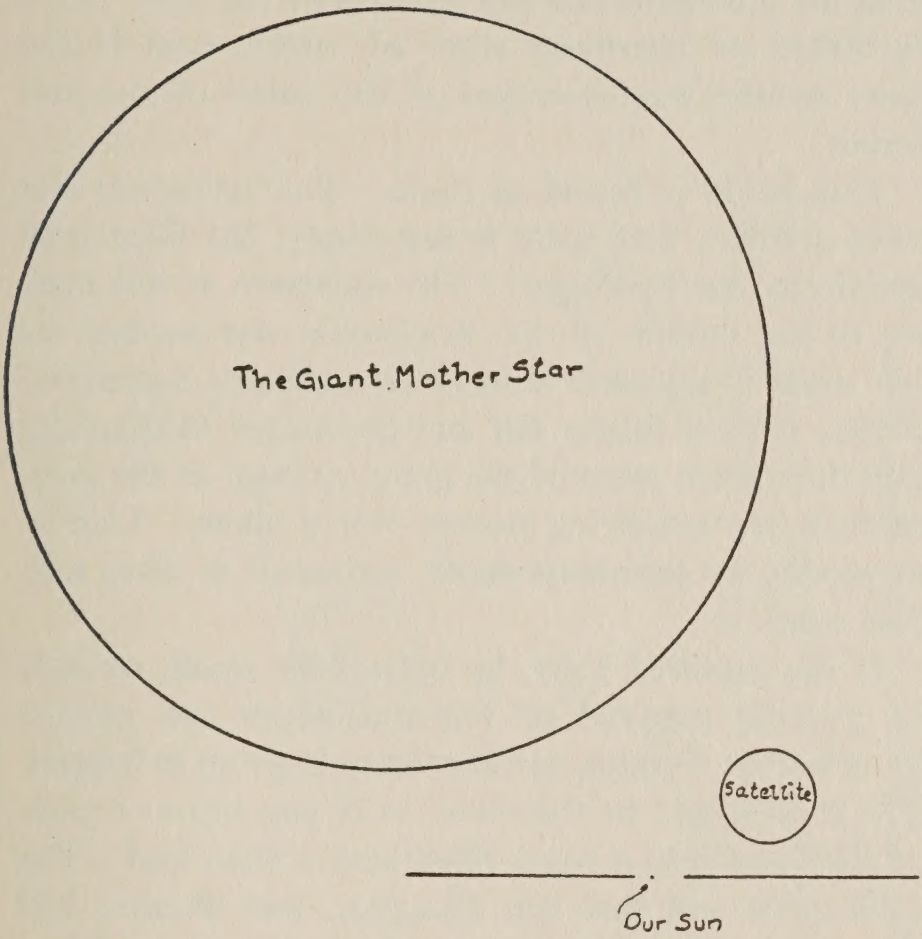

FIG. 1. PROPORTIONATE DIMENSIONS OF MOTHER STAR AND BOMB, AND THE SUN, AS A BARELY PERCEPTIBLE DOT, FOR COMPARISON.

The giant star is assumed to have the size of Betelgeuze in the constellation Orion, with a diameter of 275 million miles. Assuming an average density of 10, there can be formed out of the mass of this star 200 million suns of the size of our own. Such a star would be incandescent, with a temperature of about 3,600 degrees Fahrenheit, but would have no photosphere; it would be, however, surrounded by a strong envelope of hydrogen.

The bomb is assumed to be the size of Arcturus in Boötes with a mass equal to 40,000 suns like our own. This star cooled during the eons, when it travelled as companion star of the giant, and became water-soaked and frozen, so that after its fall into the mother star the cosmic explosion took place.

the water formed chemical compounds in its interior with the molten metals and silicates of the core. This furnished an enormous store of water, even if the outer mantle was destroyed at the union of the two bodies.

This union is bound to come. You remember our third premise, that space is not empty, but filled with atomically fine hydrogen? The resistance of this matter to the motion of the companion star around its sun made it approach it in more and more narrowing circles, until it finally fell and penetrated tangentially into the molten mass of the giant, as deep as the pressure of the underlying masses would allow. This is, of course, an enormous depth, estimated at sixty million miles.

If the captured body, be it large or small, consists of glowing material or material which can become incandescent, nothing extraordinary is going to happen. The process will be the same, as if you throw a piece of solid lead into a vessel filled with molten lead. The solid metal will sink and disappear, and likewise will the captured star gradually be heated in the body of the giant and disappear. A different case, however, presents itself, if the intruding body is permeated with water and frozen.

Our star came to rest in the interior of the star-mother and we shall leave it for the present to its fate, a deeply imbedded, water-soaked mass in the giant body, as we have to make some other preliminary observations and rather dangerous experiments in order to better understand the remarkable things which are to follow.

I should merit the reproach that I had disregarded intentionally scientific facts, if I would simply claim

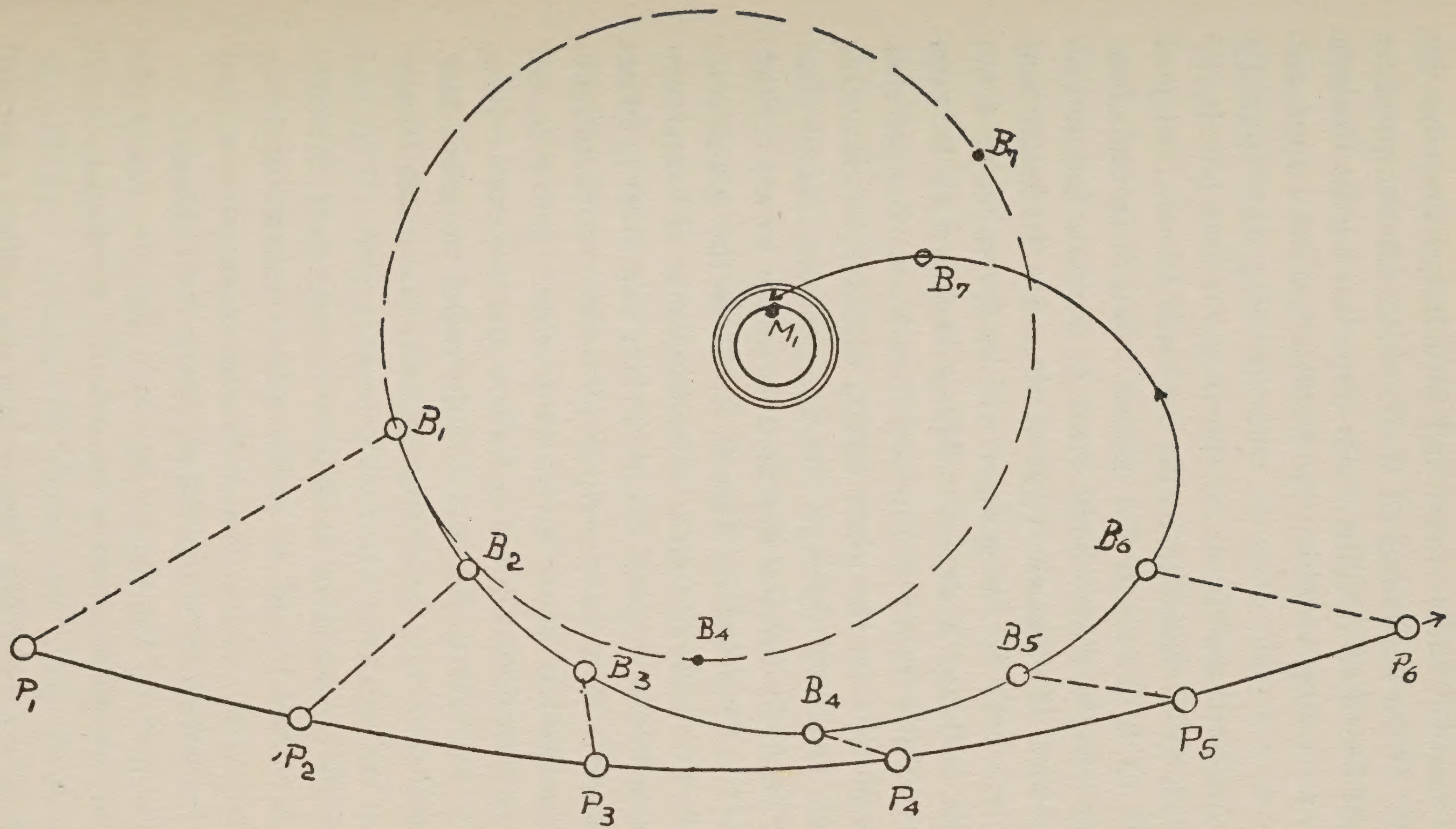
B₁
B₇
M₁
B₁
B₂
B₆
B₄
B₃
B₄
B₅
P₁
P₂
P₃
P₄
P₅
P₆

FIG. 2. THE PATH OF THE SATELLITE BEFORE CAPTURE.

that smaller bodies must fall into larger ones on account of the shrinking of their orbits, for the question might be asked whether I am acquainted with Roche's law, according to which the smaller body can approach only to a certain distance without being torn apart by the gravitational force of the larger. The law is, of course, quite familiar to me and will be used when I come to speak about the moons. But it is not absolutely certain that a body *must* in practice follow this theoretical law based on gravitation, for the larger and colder a body is, the greater will be the cohesive force of its building materials. Many bodies may be torn apart in this way, but now and then it may happen that a body falls on the giant intact, especially if its orbit allows it to cut through the danger zone faster than it is possible for the destructive forces to act. Such a case is depicted in Figure 2; M is the giant star, which the dark and cold companion star B has slowly approached in a spiral-elliptic orbit; this orbit is interfered with by a third body P [P1–P6] which attracts the companion closer to its own orbit. But it is not strong enough to hold it and when this influence ceases, due to increasing distance, it approaches the main star, but this time in a much shorter path, in a much steeper curve, tangentially, and finally penetrates it. This last stage of preparation is shown by the path B1–B7; the newcomer, cold as outer space, imbeds itself in the main star, whose molten masses close above it, and it is transformed into a bomb, ready for explosion.

This part of the theory has met with the ready objection that such an ice body, entering the incandescent mass of the giant sun, would immediately explode. It would never penetrate deeply into the mother star and thus become a cosmic bomb. You shall witness an experiment made by Hoerbiger, who was always ready to demonstrate the truth of his assertions, but I do not advise you to repeat it on your own hook, unless you have made very careful preparations. It is a very dangerous experiment.

Hoerbiger first threw small particles of ice on a heap of glowing furnace slag and saw that they exploded promptly on touching the molten mass.[1] Then he designed a pair of specially constructed tongs, and grasping with them an ice block as large as a head of cabbage he immersed it deeply into the glowing material. Right here might have been the end of Hoerbiger, of the Glacial Cosmogony, and the entire controversy; the courage of the man, who had the courage of his convictions, was superb and he succeeded. Nothing whatever happened and after a short time the ice block was withdrawn. It appeared that the ice was covered with a solid mantle of slag which is known to be a poor heat conductor. It had insulated the ice block and prevented a too rapid penetration of the surrounding heat into the interior of the ice. If the slag formation appeared in this experimental ice block which had a temperature of a little under 32° F., it would most certainly appear in the case of a body of almost the temperature of absolute zero, with the same result that the body would be promptly enveloped by a heat-insulating mantle, which would prevent a sudden rise in temperature.

And now while the enormous cosmic bomb is still resting in the womb of the mother star, enveloped in its mantle of slag, we have to make a further little digression.

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[1] A simple, but dangerous, experiment will prove that such explosions take place. If you immerse a ripe, unbroken buckeye into a vessel of hot fat, a veritable steam explosion will take place after a short time. But as this explosion is rather violent, I would recommend taking careful precautions before attempting the experiment; particularly the face and the hands would have to be guarded.

We all know, of course, that liquids, when sufficiently heated, will reach a point where they begin to boil, the boiling point of water under pressure of 760 millimetres being at a temperature of 212° F. But when water is heated slowly in a perfectly undisturbed vessel, this point can be raised above 212° F. and the water will not boil. If, however, this extraordinary state is disturbed by the slightest draft of air or the least shock to the vessel, the retarded boiling occurs suddenly with a formation of steam of such force that it forms the most violent explosive known to us. Many frightful boiler explosions have been due to this cause.

Our cosmic bomb of immense size rests, perhaps for ages, perfectly undisturbed in this glowing mass of the mother star, the boiling point of the water which it contains is retarded and the surrounding heat of the incandescent star substance gradually penetrates it. The situation is decidedly dangerous, as the water, retarded from boiling, is furthermore under the immense pressure of the mass lying over the bomb and the tension is increased by the intensity of this pressure.

And now the immobility of the superheated ball is suddenly disturbed. Perhaps a local development of steam breaks through the coat of slag, lightens the ball somewhat and thus raises it a little from its position of rest. Or a large meteor hits the giant star over the imbedded bomb and jars it slightly or its balance is disturbed in some other way. Immediately we have a catastrophe! Steam is suddenly generated and an explosion follows of such magnitude as our poor mortal senses cannot possibly conceive. Steam in this particular state possesses an explosive power greater than any other known on earth; dynamite and other explosives are mere child's play compared to it.

From a cosmic distance an observer would see the event as a slow, majestic exhalation of a fiery cloud from a bright star and would wonder what is happening. In reality a cosmic explosion has taken place and an enormous funnel-shaped mass of star substance and glowing hydrogen is torn from the star and blown into space with inconceivable force. The impetus with which the mass is thrown out is so enormous and the initial velocity so great, that a part of the mass reaches such a distance from the mother star that it escapes from its gravitational field altogether and continues its journey through space in the original direction. By far the greater part of the mass falls back on the mother star in a wide arc, but a large part of the mass never returns and a new world island has been created.

If the violence of the explosion was not sufficient to drive the expelled masses beyond the gravitational field of the mother star, they will all fall back again to its surface, which is considerably heated by the impact. Seen from afar the star will suddenly flame up, and then gradually fade again in a short time, and we often observe this phenomenon in the heavens at the appearance of a so-called nova, or new star.

The direction in the case of our solar system was toward the constellations of Lyra and Hercules and our sun and its satellites still travel in that direction through the universe by the law of inertia, although the force of the initial thrust of the explosion has been expended eons ago.

Now let us pause again before we follow it in its journey and listen to some objections which may be made by critical people. One could say that the theoretical construction of such an event is an easy matter, but can it be proved that such a cosmic explosion has ever occurred or is possible? It is true that such an explosion has never been witnessed by an observer, but that does not mean much. Astronomical observations with telescopes, on a scientific basis, have been made for only a few hundred years and such an event probably does not happen frequently. Cosmic time and human time cannot be compared.

The reason why so few observations and calculations are available is also due to the fact that the motions of the stars have been examined chiefly with a view of determining *in what direction they are travelling, but not where they come from.* But some facts which bear out our claim are at our disposal.

Flammarion, the well-known French astronomer, found three stars whose paths if traced backward would intersect. May we not assume that this intersection point is the place of their common ORIGIN? There is in the sky a star cluster, a group of stars, called the Hyades, and of this group the Director of the observatory at Goettingen, Schwarzschild, writes: "The average distances from one another of the individual members of this group of stars amount to 18.6 trillions of miles." Again an inconceivable figure, but let us reduce it to human dimensions. If we reduce the Hyades stars to the size of pin heads, the average distance from one another is 18.6 miles. "It is therefore proved that 40 pin heads, 18 miles distant from one another, travel through space together in some mysterious connection. This quiet, companionable journey through space gives one the intense feeling of a higher purpose which lies back of their motions, although it is difficult to express it precisely. One is tempted to think that the stars were projected together into space through the explosion of a great central body. But such an explosion must have given the stars an immense initial velocity, in order to overcome their mutual gravitation, and it would have been a remarkable coincidence if that velocity should have been exactly sufficient to take the stars into their present relative positions. According to this hypothesis it would be much more probable that the system is still expanding, which does not seem to be the case. It is, therefore, preferable to ascribe the origin of the system to a large primordial nebula, which originally extended over the entire area of the present system and later condensed parts of its mass—each part in its place—into the present stars."

Except for the final sentence, written under the influence of the Nebular Hypothesis, we can find in the words of this eminent scientist a full recognition of our theories. We are pleased to know that the possibility of a star explosion in a certain direction is at least theoretically admitted by such an eminent scientist. The day will come, when someone will take up the thread where Schwarzschild left it and corroborate the correctness of Hoerbiger's principal thought.

The claim that an enormous mass, ejected by explosion from a giant star, could receive such an impetus as to escape from the gravitational field of the mother star has induced many professional readers of Hoerbiger's book to lay it aside with the simple remark: "Fantastic." The Laplace Theory with its incandescent gas balls still holds the fort. Gravitation is one of the great mysteries of physical science. We know some of its laws, but nobody really knows what it is; it might be a suction and it might be a pressure. There is no doubt about the happening of cosmic explosions; in no other way can star clusters, star groups, drifts, stars which rush with a speed of 180 to 300 miles a second through space, and spiral nebulas with a speed of 300 to 1000 miles a second, be explained, not even if later astronomical works try to explain these motions as gravitational phenomena.

It is said that there is a common goal toward which the stars of the Hyades group are flying, like chickens hurrying from all over the barn yard for feeding, when the farmer's wife is calling. Could they be bound for a single point of attraction and have been formerly farther apart than they are now? This is an impossibility which cannot be visualized technically. It is much more reasonable to suppose that the paths of these stars do not meet ahead of them, but behind them, that they therefore come from a common point of origin. This is technically reasonable, and one can visualize them as glowing masses, shot from a mother star, whose paths have gradually diverged. The Hyades cluster is an explosion sheaf. An illustration shows this plainly, but the picture is still used to prove a "common point of attraction" toward which the single stars are supposed to move.

But let us return to our fiery cloud of star substance, which has left the body of the mother star through a cosmic explosion. The strongest initial impetus expelled a sheaf of molten star matter radially from the plane of the equator. Then followed a second mass from the deeper layers, composed of larger fragments, also at sufficient speed to escape completely from the gravitational attraction of the mother star and continue through space by the effect of inertia. What then followed were stray pieces which were thrown out a considerable distance, but eventually fell back again to the surface of the mother star, because the force of the explosion was partly exhausted and not sufficient to carry them out of gravitational reach.

It is possible that the entire event was not solely the result of the explosive forces of steam and that other physical and chemical processes had a share in it. But this is not important. Let us remember that the explosion resulted in an expulsion of material, as is usual in blasting, and did not act like a shot from a mortar, for a channel for such a shot could not have been formed in liquid or semisolid material. Generally speaking, the sheaf of the explosion originated in the outer parts of the rotating body of the star and left it in the equatorial plane where the greatest velocity exists. Thus it carried with it the impulse to further rotation and the expelled masses assumed a movement, directed forward to the left, just as if they had been thrown lightly from a shovel.

Herein lies the origin of the rotation of our sun and the revolution of the planets and other bodies belonging to our solar system, when they later gathered around the mass-center of gravity and developed with the latter.

This will be quite evident to those of my readers who have technical training or are endowed with a technical sense. But, in order to make it clear to everybody, let us use an illustration. We have two cannons, of the same bore, both standing on the same platform or emplacement. They are connected in such a way that they have the same firing chamber, so that one shot will expel both balls at the same time. The one on the right is turned somewhat to the right of the common center and the left one points a little to the left, so that the two cannon balls, when the gun is fired, will diverge from each other. The left barrel we load with a heavy iron ball and the right one with a light one of aluminum, and now we fire the double cannon. Now strain your imagination a little and imagine the two balls connected by a mysterious, invisible, but non-tearable band which takes the place of the force of gravitation. As soon as the balls leave the cannon's mouth, the right, light ball will try to run ahead, but will be held by the invisible band of the slower left ball and then be forced into a rotation around a common center which lies on a straight line between the two gun barrels. In short, the right aluminum ball will be held back and turned to the left, while the left iron ball will be speeded up and driven behind the other to the right.

Our explosion does not take place in one direction, like the shot from the cannon, but in one plane from a moving body, on account of the rotation of the mother star.

In our illustration, Figure 3, the letters R.W. would designate the flight of the aluminum ball and L.W. of the heavy iron ball. But there are at R.W. myriads of light balls and at L.W. myriads of heavier ones. All these balls consist of glowing star material and gravitation holds them together, like the invisible band of the cannon balls.

They are attracted to each other and combine, so that the number of glowing balls constantly diminishes, the larger ones capturing the smaller ones. On the left wing this process will be faster, because here are the large masses, which have greater gravitational power and here gradually forms the great central mass which later on becomes the sun. On the right wing a multitude of smaller balls whirl around, which later combine into a small number of individual masses, which are the inner planets. Today we know only Mercury, Venus, Earth and Mars, but originally there were perhaps thirty of them and there must have been more of them, even at a time when the earth already carried living beings on its surface.

CHAPTER IV

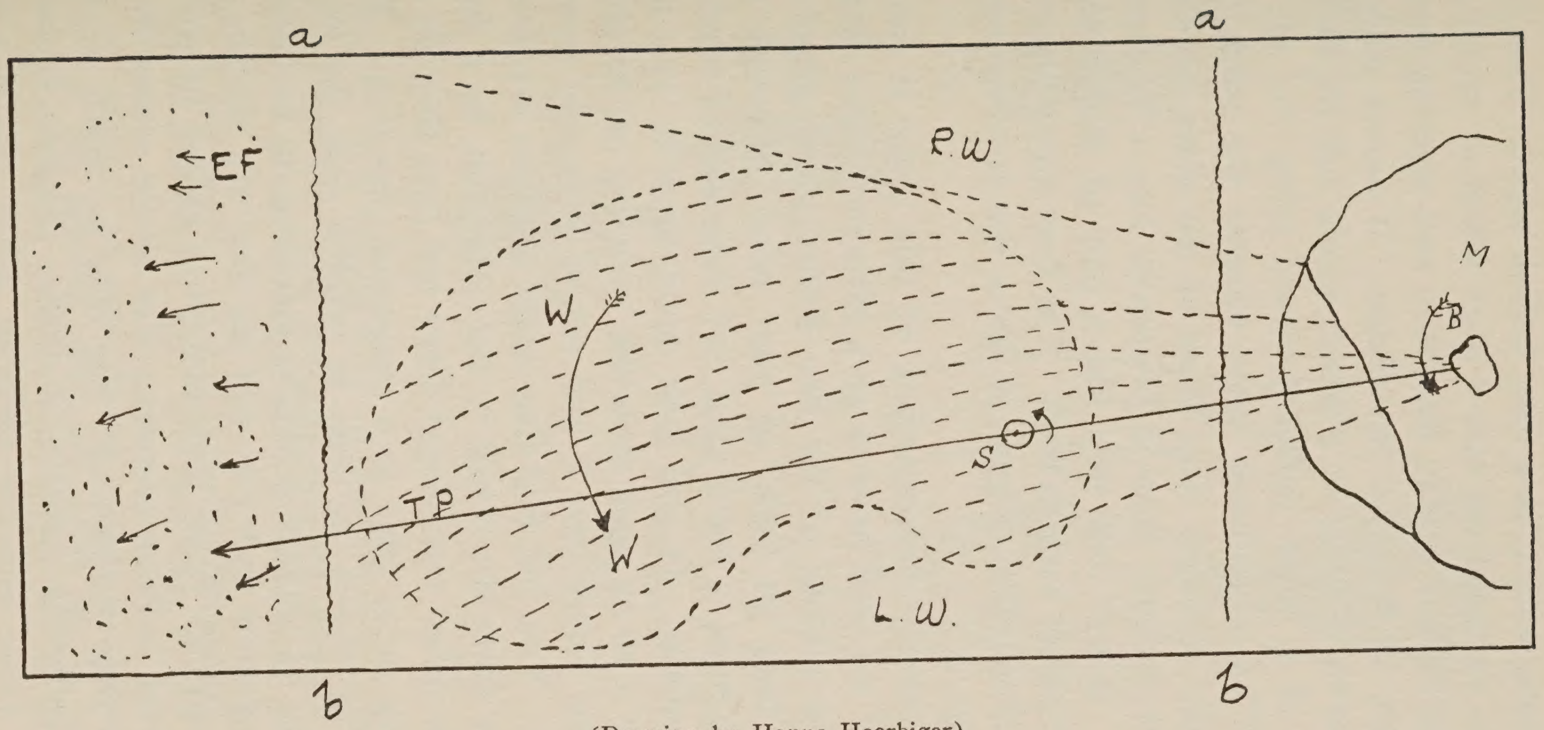
The Birth of the Sun from the Whirling Chaos

If we project ourselves into space and look down upon the giant star-mother, after the explosion had torn a deep wound into her, a wound which, however, quickly scarred over, we see a picture somewhat like our illustration. We look upon the north pole and the explosion-funnel, now already closed and moved somewhat in the direction of rotation.

The main features of the cosmic event, shortly after the bomb left the star, can clearly be seen. Far in advance are the smallest and lightest fragments, speeding away into space. A little behind follow the heavier masses, and we notice that a rotation has begun around the already forming mass center. The lighter masses, far in front, do not participate in the rotation of the main mass, but only in the slightly curved forward motion.

We shall now have to go somewhat into the mechanics of the development of this whirling, glowing chaos into an orderly system and become somewhat technical, but let's not be afraid of that—with the help of the illustrations we shall overcome all difficulties.

The heavy, glowing center mass of the chaos, due to its greater impulse, whirls around its axis, while storming forward through space, and tears the entire


a
a
EF
P.W.
M
B
W
S
TP
W
L.W.
b
b

(Drawing by Hanns Hoerbiger)

FIG. 3. THE BEGINNING OF THE SOLAR SYSTEM. (See p. 49 for explanation.)

mass along with it in a wild, hellish whirl. The structure has flattened out into a huge wheel or rather disc with the highest part in the center and tapering toward the edge, an irregular lens-shape. It moves with the edge forward, not like a wheel would roll on its rim, but as if it were pulled forward lying flat on the ground. Gravitational force attracts the parts near the center stronger than those at the outer edge and our lens changes from a bi-convex into a bi-concave shape. It will look now like a pair of dinner plates glued together back to back. The four upper drawings of the illustration, Figure 4, show the development at this stage.

The correct understanding of this phase is important and we shall have to go a little more into details. Keep the picture of the two dinner plates glued together, back to back, in your mind, although our whirling mass is not a solid, but composed of myriads of fragments. If you look down upon it, you may compare it to an open umbrella, standing on its point. Put some water into it and rotate it rapidly around its axis. You will find that water particles are driven violently from the center to the outer rim, by a force which is called centrifugal force and that they fly off from this outer edge in a tangential direction. This cannot, of course, be done in practice with the lower concavity of another umbrella standing on its handle, but imagine it and you will see that the thrown-off water particles from both umbrellas escape in wedge shape from both outer rims. Not all the water, however, is thus thrown off, but only so much as has gained sufficient centrifugal force. Figure 4 shows how all those exploded particles which exceed a certain distance from the center by their centrifugal force

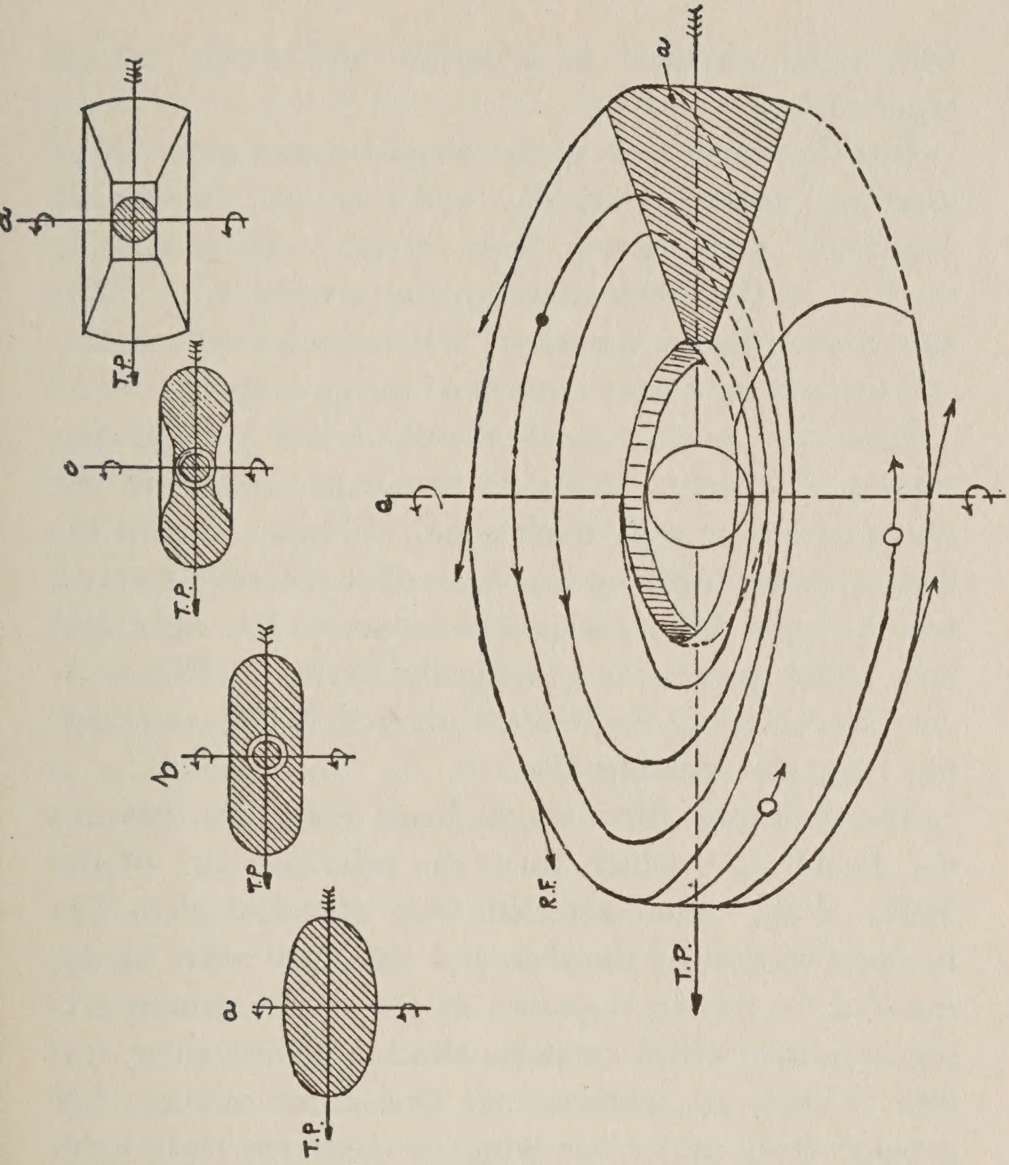


Fig. 4. The Development of the Whirling Chaos.

The arrows T.P. in all drawings mark the direction in which the system is travelling through space, the translatory path of the sun. At *a* we see the masses gathered into an oval lens, rotating rapidly around its axis. At *b* this lens has flattened out and at *c* has become a bi-concave disc. The final stage is seen at *d,* of which the large figure *e* shows a perspective view.

In the wedge-shaped space, marked *a,* move the chaotic masses of glowing star material, which are driven out by centrifugal power (at R.F.) and form later the dwarf stars of the sidereal Milky Way.

The mass-centre is located at the central ring, where the sun is being formed, and in the space between it and the wedge-shaped ring began the formation of steam and ice which forms today the visible Milky Way.

will move outward in a spiral and finally escape tangentially.

In this bi-concave, wedge-shaped space move these disrupted masses, marked *a,* and form the "revolution fugitives" after having been ejected. Their path is marked in the illustration by the arrows R.F. The sun is now in the center of the incandescent masses, and the general rotary motion of the gyro starts.

Now we have a wild chaotic whirl of glowing masses, densest naturally in the center plane, in the shape of a disc with thick edges, thinning toward the center, surrounded by the mist of a rotating shower, whose single drops escape into space to the right and left. This process is graphically shown in Figure 4. The "Revolution Fugitives," marked R.F., are escaping from the rotating disc.

We shall meet these single drops again, for they are the dwarf stars which form the principal part of the Milky Way. The fact that their principal plane lies in the direction of the shot and that they move as demanded by the development of the entire structure is the only link which connects them with our solar system. They are children of the same mother, but escaped from under her wings and started their independent life-journey early and will continue it without being able to return home. We shall leave them here, the first fugitives from the incandescent whirl, and return once more to the development of the glowing chaos.

The rotation of the heaviest masses has begun. The chaos moves forward through space at a speed of about 12 miles a second, and we are journeying through infinite space on a cosmic projectile.

By gravitational force a core of heavy bodies is formed, the embryo of our sun. If we project ourselves into space at this point and observe our developing solar system, it would look, seen from a not too distant star, like a faintly luminous nebula, perhaps somewhat lighter in the center, such as our telescopes discover in great numbers in the universe.

When the incandescent mass was expelled from the mother star, immense quantities of oxygen were liberated, when the high pressure changed to the near vacuum of the universe. Liquids and molten metals are able to absorb, under pressure, great quantities of gases and to liberate them again when this pressure disappears. If one considers that the mass of the earth consists of 49% oxygen, it may be assumed that the other stars are also rich in oxygen. This gas escaped now from all these individual bodies, but gravitation held it together with the general rotating mass.

Have you ever seen the mechanism of a rotary pump? The principle of it is that a rotating disc exerts a suction, that is, it attracts liquids or air from its surroundings and then drives them by centrifugal force to the rim, where they leave the disc to fly off; this same principle works in our cosmic case on a gigantic scale. Our rotating disc of a glowing chaos sucks in from the surrounding space the material with which this space is filled, that is, very finely distributed hydrogen. It will be sucked into the spinning, glowing gyro, pressed into the interior of the lens and here come into contact with the highly heated oxygen.

Do you remember from your school days a little chemistry? What happens when hydrogen and oxygen meet? They combine, of course, two atoms of hydrogen and one of oxygen, to make the chemical compound H_2O, the common name of which is "water." In this heated neighbourhood it will be in the form of steam which our rotary-pump disc will force to the edges of the system and there it will flow off and reach cooler regions. What happens now is well known to everybody. The steam, cooling off on contact with the icy space, condenses into water and turns almost immediately into snow and very finely grained ice.

The system still has the shape of a bi-concave disc, concave on both sides, enveloped in a cloud of lurid steam and at the outer border consisting of large conglomerations of snow and ice blocks. There might have been in this wild whirl some meteoric bodies which served as condensation centers for the masses of ice under their attraction, and they combined and enlarged constantly and rapidly through collisions. In this wedge-shaped ring we have that part of the later solar system where the large outer planets originated. These are constituted chiefly of ice, with a core of star material, as is shown by their low specific gravity, which is not much greater than that of water. Of that, however, you shall hear later in detail.

The formation of ice goes on on a cosmic scale, and, titanic as these ice-planets are, only a small portion of it goes into their structure. There is an enormous source of oxygen in the glowing system and an inexhaustible supply of hydrogen filling all cosmic space. Steam, snow, ice is pushed out in a vast ring into space, partly by the pressure of the steam, generated in the interior, and partly by the centrifugal push of newly generated masses.

Hundreds of millions of miles away from the central

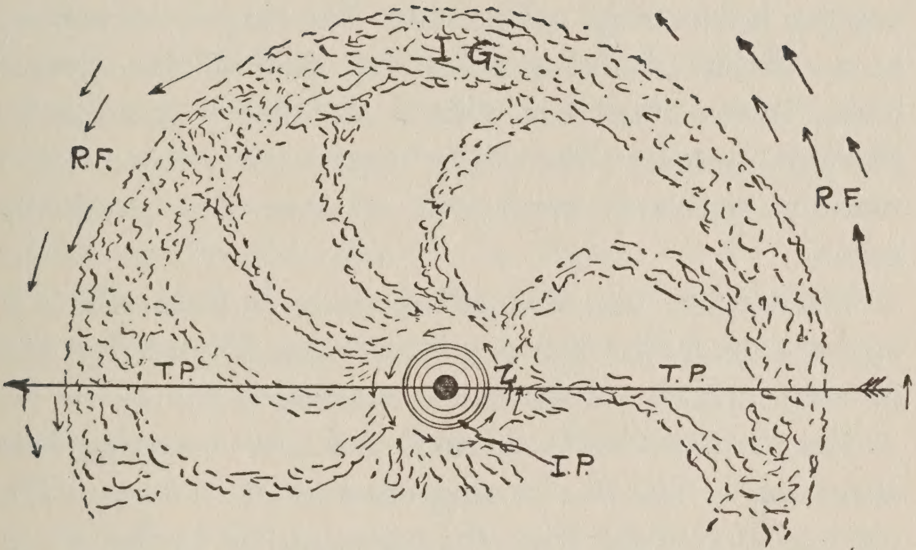


Fig. 5. The Development of the Milky Way.

T.P.	Translatory path of the sun.
Z.	Zone of snow-bodies where the outer planets originate.
R.F.	Revolution fugitives which later form the Sidereal Galaxy.
I.G.	Ice Galaxy or visible Milky Way.
I.P.	Space where the inner planets are formed.

mass extends this ring and it reaches the limit of its gravitational field and finally goes beyond it. As long as it was within the gravitational field it took part in the general rotation, but gradually this ceases and the immense ring of ice bodies of all sizes stops rotating, because its individual parts gradually lose momentum through the resistance of the cosmic ether.

The generation of water in the interior of the whirl has now ceased, due to the fact that the supply of oxygen is becoming exhausted. The ring of ice bodies, now outside of the gravitational field of the central mass, loses connection with it and becomes an independent system. But their inertia still drives them radially outward, until this motion also gradually ceases.

The system has now advanced to a state where it appears somewhat like our illustration, Figure 5. The translatory path of the sun is marked T.P.

The "revolution fugitives," R.F., are escaping into space and at I.G. the ice-ring has started to form. The outer planets come from the zone marked by the arrow Z., and the inner ones, from Mars to Mercury, are quite near the sun in the space marked by the arrow J.

And now comes an astonishing revelation, a stupendous discovery! This wreath of ice masses is the visible *Milky Way,* that great enigma of the sky!

But let us return once more to our rotating disc, travelling in space with its cutting edge forward. It meets, like all heavenly bodies, the resistance of the cosmic ether, very fine hydrogen gas, and it acts exactly as a similar structure would act on earth under similar conditions. Our experience is that rotating discs, loaded in the center, when thrown with the edge forward have the tendency to assume an upright position, vertical to the plane of flight motion, under the influence of air resistance.

You can easily make the experiment yourself. Take a light wooden hoop, such as children roll on the street, and fasten a lead ball in the center with strings. Then place yourself on an elevation and throw this hoop, held horizontally, against the wind, imparting at the same time a rotary motion. This is mechanically the same condition as encountered by our cosmic disc and the result will be the same. The lighter rim of the hoop is affected by the resistance of the air to a greater degree than the heavy lead ball, because that tries to move faster by its greater inertia. You will see that the hoop will lift its plane and erect itself vertical to the direction of its flight.

In our cosmic case, the central mass (which later will become the sun) represents the lead ball, while the centrifugally moving ice masses and the mixture of ice and other bodies nearer to the center represent the hoop. The sun will have a tendency to outspeed the loosely built-up structures around it, and consequently the plane of the revolving masses is tilted downward and forward to the left.

The ice ring, however, ceased rotating, and with the cessation of rotation the ability of tilting against the direction of the flight diminished. The present position of the central plane of the Milky Way against the original plane of flight has been measured, and it was shown that a cessation of a downward tilt took place when the inclination of the two planes to one another had reached approximately 15 to 18 degrees.

Most people, when they think at all about our solar system, as it appears in space, imagine it to be like a flat ring with the sun in the center and the planets circling around on a plane horizontal to the direction of the flight; as if the whole system were lying, so to say, on a table top. That, however, is an erroneous impression. The inclination of the orbits of the planets, which is called the ecliptic, has now reached an angle of about 60°, which is clearly shown in Figure 6.[1]

This tilting process will go on until an actual vertical position has been reached. But that lies far in the future, for the massive giant among the planets, Jupiter, resists this tilting process and forces the other outer planets into its own ecliptic and also holds the inner ones in its own plane, for these would, on account of their greater velocity, erect their course faster.

Another ring of ice bodies, which had not reached connection with the Milky Way and had not combined with the outer planets at their formation, still circles outside of the orbit of Neptune, at the farthest limit of the sun's gravitational field. They are called the trans-neptunic planetoids, and as Jupiter's gravitational force has very little effect outside of the orbit of Neptune, this ring of ice bodies has not been drawn into the ecliptic and revolves still in the original plane without participating in the tilting process.

Herewith closes the chain of cosmo-mechanical events, which lead to the formation of our system from its origin as a cosmic projectile to its present status.

Before we close this chapter we will let the entire process pass before our eyes once more. First comes

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[1] Prof. Dayton C. Miller of the Case School of Applied Science has been trying for years to prove the existence of a resisting medium in space, a hypothetical medium, which is the carrier of light, heat and radio waves. He pictures the solar system as a dynamic disc, hurtling through a resisting medium and erecting itself perpendicular to the line of motion. This is exactly the same hypothesis explained in this book and published by Hoerbiger-Fauth in 1912.

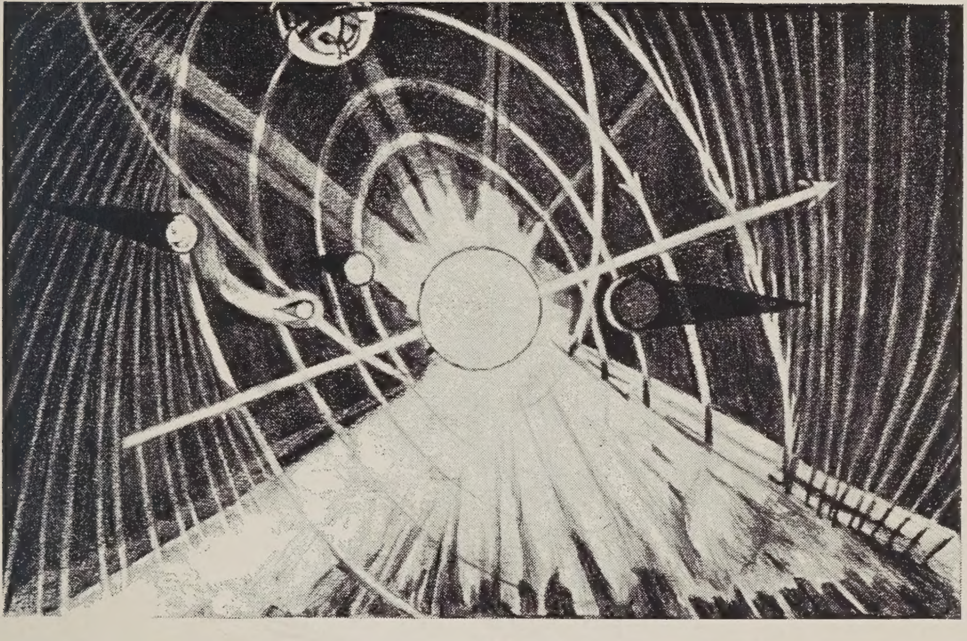

Fig. 6. The Inner Planets and the Ice Veil.

The whirling solar system with the sun in its center has erected itself to an angle of about 60° to the translatory path. The orbits of the four inner planets are shown and on the left the path of a comet. From the Milky Way streams the veil of ice blocks into the sun, forming a cone which all planets have to transverse in their orbits. This is an artist's drawing and, of course, not to scale.

the cosmic explosion which gives birth to our world island. We probably observe such explosions in the universe every time a new star suddenly blazes up, shines as a star of the first magnitude for a short time and then fades again. Then the glowing, whirling chaos of the expelled mass, ordering itself gradually according to well-known and recognized mechanical laws into a bi-concave disc shape, progresses through space with the edge pointing forward. From it fly off at a tangent all those particles which obey the centrifugal force of the rotating mass and separate in the form of a wedge.

Out of them is formed the host of small stars, which form the glowing Milky Way, seen through our large telescopes. Oxygen is liberated by release of pressure and combines with the hydrogen in space to form steam, snow, and ice, which is forced out by interior pressure and centrifugal force, until it reaches beyond the gravitational field of the system and forms the visible cloudy Milky Way. Far from being untold light years away from us, it is, cosmically speaking, very near to us, a distance about eighty times as large as the orbit of Neptune. The masses of ice, which the gravitational force of the sun holds fast, form the gigantic outer planets, of low specific gravity, mainly ice bodies. And at the very edge of the sun's gravitational field is still the ring of ice bodies, which have neither followed the Milky Way on its outward journey, nor combined to form planetary bodies, which are called the trans-neptunic planetoids.

The heaviest glowing particles in the neighbourhood of the central mass had combined to form the inner planets. Originally they revolved in many different planes, but the force of the giant Jupiter drew them all into its own plane. This ecliptic is now in the process of erection, since the sun moves through space at a comparatively slow speed of 12.5 miles a second and carries all planets along with it against the resistance of the cosmic ether. The Ice Milky Way, which at first had participated in the rotation, ceased in this motion and remained at an angle of fifteen degrees against the direction of the flight. And thus moves the entire intricate structure on its way to an unknown goal which lies between the constellations of Lyra and Hercules.

If you look over the illustrations, Figures 1 to 6, which show the various phases of this development, there should be little difficulty in understanding the process, but an ideal way of presenting it would be through a moving picture film. There would then be no doubt as to the mechanical correctness of our hypothesis; every doubt as to the possibility of such a beginning of our solar system, including the dwarf star masses of the Milky Way, would vanish.

The one and only premise is that the masses originally had a rotary motion imparted to them by the mother star. But since most stars of which we have knowledge have such a motion, there should be no hesitation in granting it in our case. It is, of course, possible that no such rotation existed. Then we would see after the explosion only a funnel-shaped cluster of stars, the members of which are withdrawing from one another as we observe in the constellations of Taurus (The Hyades), Gemini and others. Such a cluster appears funnel-shaped only when seen laterally from a cosmic distance; if the observer is placed in space above or below the cluster, he would see it as a spherical arrangement of individual stars.

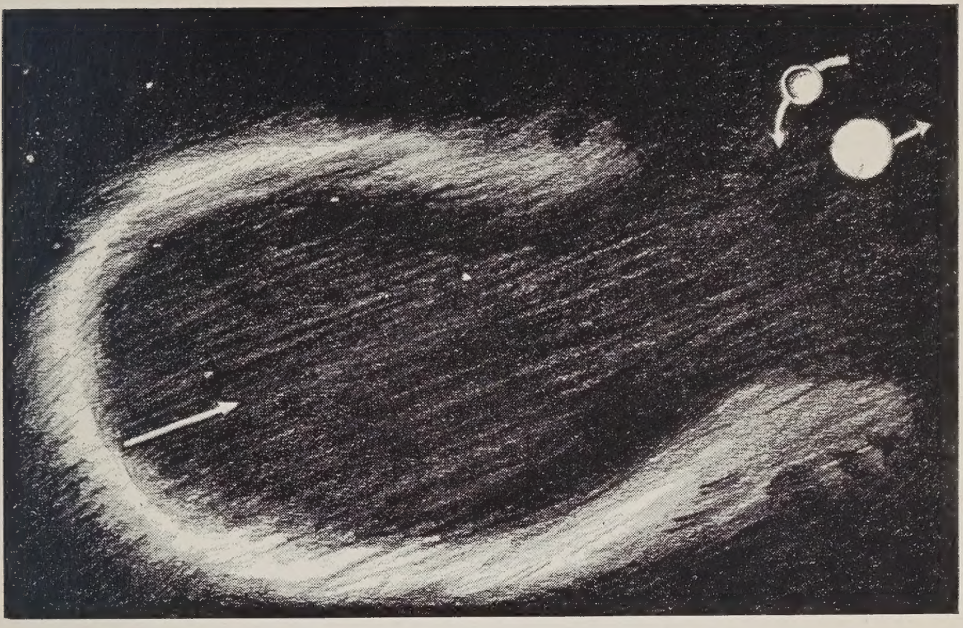

FIG. 7. THE SOLAR SYSTEM AS NEBULA.

As in the beginning our Solar System looked like a nebula, seen from a cosmic distance, so it will again look like a nebula at the very end. The sun will advance beyond the outer rim of the Ice Galaxy, leaving a yawning gap behind, which gives the Milky Way the appearance of an Omega Nebula. All the inner planets have found their last resting place in the sun and the outer planets have all combined with Jupiter, the giant of the Solar System, who circles around the sun, as the only satellite left, in lonely grandeur. Still later, Jupiter will also break up into an ice ring, floating around the sun and will vaporize gradually, which will give the sun the aspect of a nebular star.

The further development of such a structure would depend upon the existence of a sufficiently large central mass, large enough to dominate the other members of the cluster.

Our sun with its escort of planets is no longer in the center of the ice galaxy ring. It can more readily overcome the resistance of the medium in space than is possible for the loosely connected ice structure, which offers a greater surface. Gradually the sun will advance and pass the forward part of the ice ring, leaving in the far future a yawning gap behind it. To an observer from a cosmic distance the Milky Way will then appear as a so-called Omega Nebula, thus named after the letter Ω of the Greek alphabet.

In the illustration, Figure 7, you see the Milky Way as an Omega Nebula. The sun, with Jupiter as the only satellite, has advanced beyond the anterior rim and is leaving it behind.

Explanation of Fig. 3, p. 37.

B marks the place where the bomb rested before the explosion. The direction of the shot is marked T.P. The explosion masses R.W. and L.W. are beginning to rotate. The lighter masses at R.W. out-speed the heavier wing at L.W., but are forced by gravitational attraction to turn in front toward the left. In the vicinity of S originates a complete revolution around the main mass in the direction of the arrow. W.W. is the path of those escaping masses in relation to cosmic space which now form the glowing dwarf stars of the Milky Way, and far in front, marked E.F., are the explosion fugitives which escape entirely from the solar system.

CHAPTER V

A Few Doubts Cleared Up

If you have followed me this far in the history of the birth and construction of our solar system, you may have some questions to ask as to the correctness of the conception from a mechano-physical standpoint. First, it may occur to you to ask whether it is possible to project sufficient material into space by such an explosion, as is necessary, not only for the formation of our entire solar system, but for millions of new stars besides. This seems at first sight impossible.

The difficulty is easily overcome by those schooled in cosmic thinking. Remember, we are not dealing with earthly affairs, but must think in terms of the infinite universe.

Since we know that there are giant suns in existence, surpassing hundreds of times in size that of our sun, we may suppose that our giant had a diameter 300 times that of our sun. A simple mathematical calculation shows that from such a body we could form 27 million suns, each as large as ours and our sun is counted among the larger stars.

How many dwarf stars could we produce, if we assume them to be in size 1/3 to 1/5 in diameter that of our sun? It would mean that from 27 to 125 of the smaller stars could be made out of the mass of our sun. Let us take an average of 50 and let us assume that only 1% of the mass of the giant star is thrown into space at the time of the explosion. This is enough material to form 270,000 suns, equal in size to our own, and we need only one, and sufficient material to produce 50 x 270,000 or 13,500,000 galaxy stars! There is no reason, however, why the mother star should not have been considerably larger, or why a larger fragment than 1% should not have been projected. This disposes of one objection.

But there may be a sceptic who says: All this sounds very well, this formation of an ice ring of enormous extension and a vast distance from the sun which we see as the Milky Way, but such a hypothesis is merely bold and too fantastic to be credible. It was bold more than thirty years ago, when Hoerbiger formulated it, but since then the existence of giant suns has been proven and is accepted by astronomical science, the fleeing stars of Flammarion have been found and Schwarzschild made his observation about the cluster of the Hyades. It is not fantastic any more.

Take up any good astronomical work which is illustrated and you will find illustrations of funnel-shaped star clusters and nebulas of the most divergent kinds. There is a ring nebula in the constellation Lyra, which seems to be a structure similar to our Milky Way, shining in the reflected light of its sun. There are many spiral nebulas, showing the intermediate steps of development. Most of them shine in reflected light and the light of our Milky Way is shown by the spectroscope to be pure reflected sunlight in its brightest parts. It could originate in such cases from self-luminous bodies only, if they belonged accidentally to the same spectral class to which our sun belongs. This is, to say the least, very doubtful and proves the ice nature of this structure, shining in a borrowed light.

But there are still other considerations to be taken up. I have already mentioned that in telescopes of moderate power one can still see the brightest parts of the Milky Way. This is usually explained by the fact that the luminous points are separated from one another in proportion to the magnifying power of the lens, whereby the brightness of the area diminishes with the square of the magnification. But, if the luminous points were bodies shining of their own light, they would not disappear, even in the strongest instruments; on the contrary, their visibility would increase.

But as this is not the case and the masses of dwarf stars of the sidereal galaxy appear only in largest telescopes, and often only after long exposure to the photographic plate, there must be a physical difference between the two light-emitting bodies. This sustains our claim as to the dual nature of the Milky Way problem.[1]

The identity of the spectra of the Milky Way and the sun has been determined scientifically, but the necessary conclusions have not yet been drawn. It seems that the accepted theory, propounded since Herschel's time, that the galaxy is a result of radiation of light from millions of stars, at an enormous distance from the earth, does not permit an unprejudiced examination of the problem in our sense.

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[1] As a proof of Hoerbiger's claim that the Milky Way is a part of our solar system, the following simple experiment is proposed by Georg Hinzpeter in his new book, "For and against Hoerbiger." From the wealth of material gathered in the various observatories of the world, two photographs should be selected of the same size and showing the same part of the Milky Way, about 90 degrees from the apex point of the sun. The two pictures should have been taken about 20 years apart and should show some stars on both sides of the Milky Way. From these two negatives a stereopticon picture should be made, and it will be shown that the Milky Way floats actually in space, far in front of the fixed stars.

The idea of the comparative (of course in a cosmic sense) proximity of the Ice Milky Way and its motion along the translatory path of the sun has been opposed occasionally with the objection that in such case a parallactic displacement of the brightest parts against the sky should have been noticeable. In the same sense, however, one could object to the translatory motion of the sun through space. One could say, if such motion were an actual fact, that since the day of Ptolemy the entire solar system, all the planets and the sun, should have approached the background of the stars, so that the western and eastern elongations, for instance Jupiter's, would not lie near the same fixed stars as formerly. As there is no noticeable change,—so to speak—there can be no translatory motion of the sun toward the apex.

No sensible person will make such a deduction seriously. But if such measurements are without result in the case of Jupiter, which is a comparatively near and easily fixed body compared to the Milky Way, how much less can we expect results in the case of the Ice Milky Way which is not so promising on account of its uncertain limits and its at least 200 times greater distance.

The sidereal Milky Way, composed of dwarf stars, spans the apparently hollow sphere of the sky like a closed ring, consisting of stars of small and smallest magnitude, which in most cases belong to the blue and white spectral type. They are densest in the neighbourhood of the galactic equator, but spread on both sides in diminishing density up to high galactic latitudes, as would naturally be the case if they were hurled from a rotating bi-concave body. But these "explosion fugitives" could have no rotation, because they escaped too quickly from the gravitational field of the central mass; they have only the drift to the left, which we mentioned, initiated by the impulse from the mother star, then they spread out in fan-shape and flew into far cosmic distances, always keeping their shape of a flat sheaf.

If we follow the course of the Milky Way on an astronomical globe and take as starting point the location between the constellations of Lyra and Hercules, in which the apex of the sun must be located, we find on the left the constellations of the Swan, Andromedā, Perseus. The place in the Swan is especially conspicuous by the fact that many small reddish stars, known as Wolf-Rayet stars, have been located here. The position of these nests of red stars,—also called Stratonoff's condensations after their discoverer,—at a certain place seems to be no accident, and, if we follow the way which the fugitives must have taken, we can look for them in this neighbourhood only.

All not a priori prejudiced persons will be astonished at the compelling ease with which the whole picture of development unrolls itself. But even those who do not accept the idea of a cosmic explosion will have to concede that the search for a common cause for the coincidence of the translatory sun motion with the galactic equator, of the projection of the "explosion fugitives" to a certain part of the sidereal Milky Way, for the advancement of the sun from the common center of the whole system, and for the uniform direction of the rotary and revolutionary motions of all members of this island universe, must lead to the idea of an expulsion from a rotating body. With the exception of the one chance that the explosion must have been strong enough to carry the masses with the help of inertia beyond the gravitational field of the mother star, there is not one event in the entire chain which would not have or could not have happened with necessity, under the circumstances, exactly as related, and we shall see in a later chapter that the same logical mechanical forces which once built the whole system on a gigantic scale are still active in a more modest manner and maintain the temperature of the sun and make life on earth possible.

If we went our own individual way in the explanation of the nature and the structure of the Milky Way, we did so with greater certainty, because many of the recent researches practically demand that the problem be attacked on a mechanical basis. The Engineer Hoerbiger has perhaps found a way out of the darkness which still enshrouds this part of science, for Dr. Hch Samter says in his report, "Die Milchstrasse," Berlin, 1895: "On account of the difficulty of the problem, a solution of the galactic problem may not be expected in the near future. It is good news, however, that the perseverance of industrious searchers begins to lift the veil under which the nature of the Milky Way is still hidden." The best-known expert on the Milky Way, of our present time, Professor Dr. Max Wolf in Heidelberg says, 1908, in "Die Milchstrasse": "Only this much is certain, that the Milky Way offers us beautiful and great problems, and points to phenomena and forces for which we today lack conception and knowledge. We stand before a profound mystery and our cosmos remains a poor patch-work, without its solution."

PART II

ICE—A BUILDER OF WORLDS

CHAPTER I

THE MILKY WAY

ON A clear moonless night you see stretching across the sky, a luminous, shimmering band of indescribable beauty. But if a telescope is turned upon it, the shimmer seems to disappear, and if you enlarge the power, as usually is done, it really disappears altogether and you see the numerous glittering points of dwarf stars, which we know to be the fugitives of the glowing chaotic whirl, the drops which escaped and never returned home. The Milky Way is a dual structure; the part that is visible to the naked eye consists of ice, shining mildly in the reflected light of the sun, and behind the ice is the glowing galaxy of small stars, visible in the telescope. Both structures are parts of our solar system, originated in the same way and at the same time, and are not untold light years distant from our home star, the earth.

We have learned some astounding things in the previous chapters, but there are still more wonders in store for us. The Milky Way, that vast ring of ice bodies, composed of fragments of all sizes, from the smallest to the largest, perhaps thousands of feet in diameter, is, from an earthly point of view, far out in space from our sun, in fact, outside the actual solar system. Neptune circles around the sun in an orbit with a radius of 2,800 million miles, but the Milky Way is at least 80 times as far as that from the sun and outside its gravitational field. Its movement through space is in the same direction as that of the sun, toward the apex point between Lyra and Hercules.

The sun moves through space at a velocity of about 12.5 miles a second, but the Milky Way cannot maintain this speed. It consists of loose fragments and offers a much larger surface to the resisting medium in space. It therefore lags behind and we reason consequently that today the sun does not occupy any more the position in the center of this ring, but has speeded up and approached the inner border in front. It must also have risen somewhat above the plane of the ring.

We remember that the fragments of the Milky Way were of a variety of sizes. It will be clear that the resistance of the ether will here make a selection, that the larger pieces will not succumb to this resistance as readily as the smaller ones.

If you take a handful of sand and throw it from you, as far as you can, the sand travels not as a solid, and the lighter parts, the dust and grains, will fall to earth under the resistance of the air sooner than the little stones. These, being the largest components, have the greatest inertia. This simple physical process repeats itself here in the cosmic realm. The smaller ice fragments lag gradually behind the large ring in its flight. Those of the rear and the two sides of the ring do not concern us at all, but those coming from the front have a far-reaching effect on the solar system and on our earth and our life.

Another illustration will make the process clear. Imagine a ring consisting of iron filings and that in its center rests a magnet with a definite magnetic field. The detached iron filings are attracted by the magnet and move fan-shaped to the magnetic pole. If the ring is tilted like the Milky Way, in an angle of 15 degrees against the direction of the movement, the flown-off filings will hang from the ring in a backwards slanting veil. The path which the particles take has been carefully calculated and it has been found that they form a shape like a sagging circus tent, the point of which lies in the sun.

This supply of ice from the Milky Way reaches the sun constantly, but not all ice blocks reach the surface of the sun. A great part of them is changed into ice vapor near the sun and blown into space by the pressure of light, but others of certain size arrive on the sun.

Those ice blocks which missed the sun follow rather complicated paths, after they have passed beyond it, but finally they are compelled to return and fall into the sun. We need not go into the details of these difficult calculations, it is sufficient for us to recognize that the orbit of our earth around the sun is so situated that the earth on its journey cuts through this veil of ice four times each year, in February, in April–May, in July–August and in November. Figure 6 illustrates clearly the orbits of the planets, cutting through the ice veil. We think at once of the hard post-winter days in February, the April weather with its rains, the often wet and stormy vacation time in July and August, and the autumn storms of November. During these weeks the earth might be struck by larger blocks, intersecting its path and penetrating into the atmosphere. What then happens we shall learn in the next chapter, at the present time we must follow the fate of the ice blocks which arrive on the surface of the sun.

Just as we saw at the beginning in the case of the giant mother star and the satellite which shot into it, to become, after the explosion, our solar system, so a large ice block, on entering the mass of the sun will be covered with slag. This insulates it against the surrounding heat and leads to the formation of an explosion funnel. These funnels are nothing other than the dark areas on the sun, known to us as *sun spots.*

As soon as the insulated ice block has been heated sufficiently, all water will be separated in its constituents, oxygen and hydrogen. The oxygen will be absorbed by the glowing substance of the sun, but the hydrogen will rise to the surface, like an air bubble in water, and be seen from the earth as incandescent hydrogen, a so-called depth-protuberance. Only when the slag-covered structure has completely come to rest will a steady stream of steam rise to the surface, which by its force forms the open funnel.

It is easy to imagine that a very large block may be so thickly covered with slag and penetrate so deep that, on account of the pressure of the mass of the sun, the funnel closes again from time to time and interrupts the escape of steam, similar to the exhaust of a steam engine. If you observe boiling tar or oatmeal you get an adequate simile.

Through the incandescent gas envelop of the sun breaks a mighty burst of steam with immense velocity and power.

We can again draw on our technical knowledge for an illustration. The greatest steam pressure in use amounts to 60–70 atmospheres. Such steam has a temperature of 275 degrees and its velocity when it leaves the opening of a valve is about 4,000 feet a second. This is a rather respectable speed, if you consider that a very fast train makes about 100 feet a second.

But we are dealing with the sun, where we have considerably higher degrees of pressure and heat, and consequently much greater velocities. It is very likely that the velocity exceeds 1,200 miles per second and that is important, if we are to understand the whole process.

The funnel opening on the sun (the sun spot) may have a diameter of 3,000 to 6,000 miles, as has been observed. By the enormous speed with which the steam leaves the funnel it will be disintegrated into oxygen and hydrogen only in the immediate vicinity of the funnel walls, and the main mass of it arrives in outer space still as steam.

The oxygen which originates is absorbed by the walls of the funnel whilst the hydrogen escapes into space. Now we see the reason why suns, or generally speaking, star substances, are rich in oxygen and also why hydrogen must exist in space. Our sun is only one of innumerable similar stars and the same process of receiving ice and spending hydrogen is going on everywhere in the universe. This hydrogen may be extremely fine, almost atomic, and we claim that it pervades all space and forms the ether or resisting medium in space.

Anybody who knows the characteristics of water-steam will see clearly that it must be such steam which forms the dark opening of the sun spot. Any other material, breaking forth, would be heated to such a degree that we would never get the picture of dark sun spots. But steam is the *only substance which never becomes incandescent.*

The sun spots are usually considered products of a cooling process on the sun, of an aging of our star. But measurements have demonstrated that in years of great frequency and extent of sun spots the radiation of the sun is not diminished, but on the contrary, increased. This is a fact which now becomes quite understandable.

The sun spots, which at first sight seem to be very dark, are really much brighter than they appear. But this is the effect of the light, which the incandescent mass of the sun throws upon the non-glowing steam.

One of the most frequent objections made to this explanation of the nature of the sun spots is the one which denies the possibility of ice blocks causing explosion funnels of such enormous magnitude, as have been observed on the sun. There are sometimes spots as large as earthly continents and some spots reach such dimensions that several spheres of the size of the earth might find space therein. But those who are schooled in thermo-technical matters do not find this difficult to explain.

For large sun spots it is sufficient to have ice blocks of about 600 feet diameter penetrating into the sun and larger blocks would cause gigantic spots, lasting during several rotations of the sun ball, because superheated steam under low pressure has many thousand times the volume of the original ice volume. The pressure conditions in the sun, however, will multiply this by hundreds of thousands.

It was also formerly supposed that a hail of meteors was causing the phenomenon of the sun spots, that they were openings smashed into the crust of the sun, through which the dark interior became visible. But anybody who looks at a well-formed sun spot through a large telescope will get the strong impression that

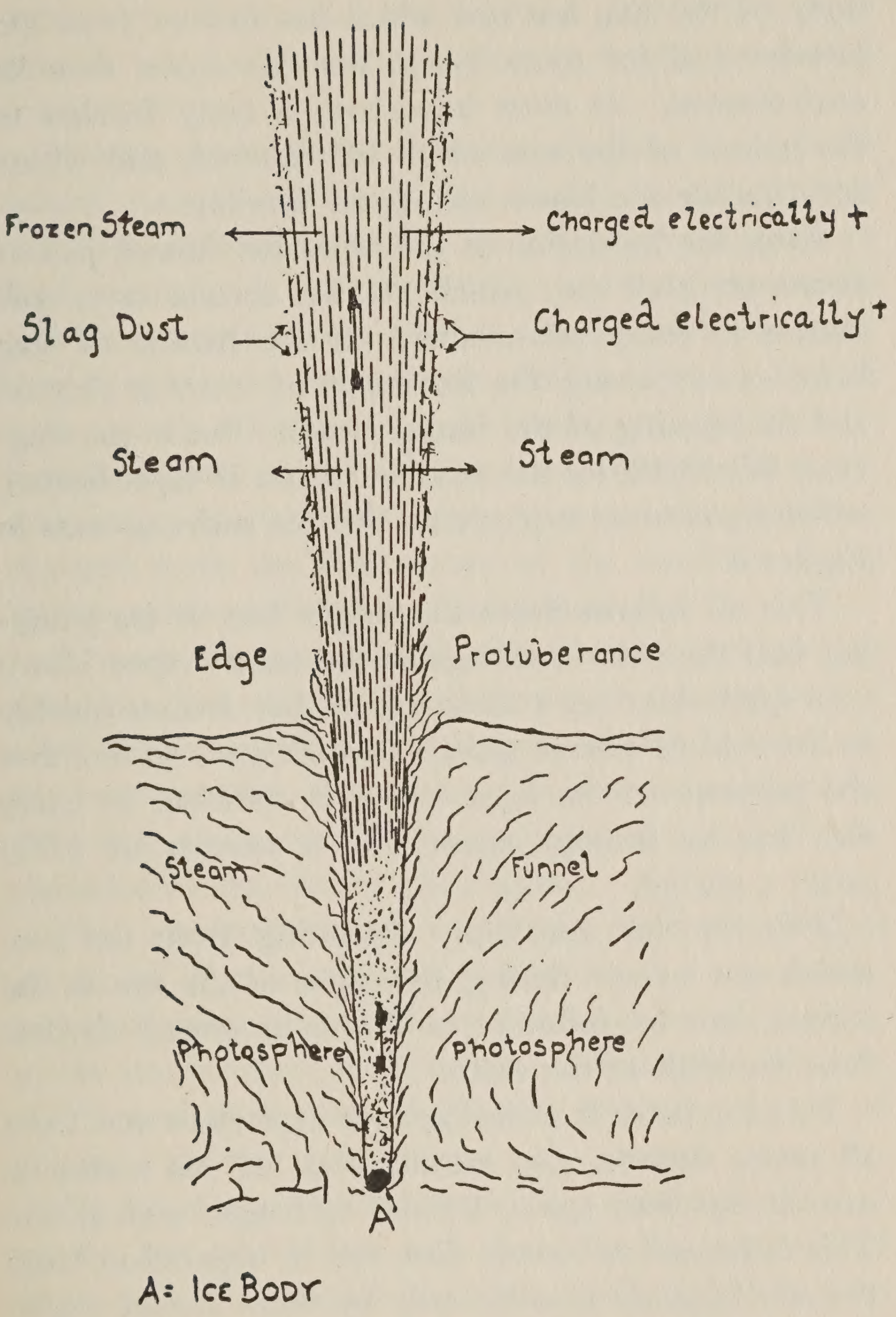
Frozen Steam
Charged electrically +
Slag Dust
Charged electrically +
Steam
Steam
Edge
Protuberance
Steam
Funnel
Photosphere
photosphere
A
A: Ice Body

Fig. 8. The Development of the Sun Spot.

we have here not a hole made from the outside in the body of the sun, but one which has broken from the interior and for some reason remains cooler than its environment. It must have been a body foreign to the nature of the sun which has entered, and whose constituents are blown out again forcibly.

After the formation of the explosion funnel, jets of steam are shot out, which are the corona rays, well known to every astronomer. If the mantle of slag becomes too strong, the formation of steam is checked and the opening of the funnel closes. But in the slag-mass filled with ice the retarded steam is super-heated, which leads to an explosion. See the entire process in Figure 8.

This all follows from the simple fact of ice plunging into the sun. And again: the steam vapor blown into space does not remain steam, but freezes quickly in the cold of cosmic space to an ice dust, so fine that the pressure of the light waves is sufficient to carry this fine ice through space with a velocity of 1,500 miles a second.

This fine ice, constantly streaming from the sun, which can be seen during an eclipse of the sun as the corona, can be followed in the solar system farther than the orbit of the earth.

It is inevitable that during such explosions and from all steam funnels, also metallic dust of sun matter is carried out into space, besides hydrogen and steam. This is known as cosmic dust and its separation from the sun becomes possible only by these violent explosions. The supposition that the pressure of the light waves alone is sufficient to carry it from the surface of the sun into space has no valid foundation. Only when this very fine dust has been carried so far out by the force of the explosion that the pressure of the light waves overcomes the force of gravitation, only then is it possible for the dust to begin its cosmic journey.

It is known that a jet of steam escaping from an insulated vent carries an electric charge, usually a positive one. On the sun the free hydrogen acts as an insulator between the jet of steam and the funnel walls and the resulting high tension charge, probably positive, is carried by the ice dust. When a sun spot with such an electrically charged corona ray passes the meridian of the sun which is turned towards the earth, and the ray reaches the earth, we have on the negatively charged earth the phenomena of the northern lights and magnetic and other disturbances.

Fine metallic and slag dust is likewise carried into space by the corona ray and it is now readily understood why a covering of cosmic dust is often found on the pure snow in the Andes. In this way otherwise dark and problematical phenomena find a natural explanation in the Glacial Cosmogony.

The movements of the ice blocks from their origin in the ice ring of the Milky Way to the sun can be technically determined. They show that certain regions of the sun are more liable to this ice bombardment than others and this agrees fully with the observation of sun spot activity.

The masses of ice dust, which are constantly formed on the sun and blown into space by the pressure of light, should be visible from the earth, for it is clear that such a mass of ice crystals must glitter in the light of the sun. This is really the case; we know this shimmer as Zodiacal Light and it can be observed before sunrise or after sunset in the twilight. The part of the ice-dust-lens nearest to the body of the sun is observable only during eclipses of the sun when the majestic spectacle of the corona is seen. Those masses which have been attracted by the earth you can see even in broad daylight if you cover the sun with a pasteboard disc of about 10 inch diameter and observe, thus protected, the sky around the sun. You will see plainly a milky curtain hanging down to the observer, the axis of which is always perpendicular to the apparent path of the sun through the sky. This observation agrees fully with the calculations and proves by its constantly changing position that it is not a terrestrial phenomenon, but a solar one. This curtain consists of the finest ice needles. A well-known Munich astronomer, Seeliger, calls this curtain sun-dust and claims it is composed of cosmic dust, but in that case the veil would appear of a red-brown color and not silvery-white.

Visible carriers of the fine ice dust which streams from the sun are the cirrus clouds, which float on an average seven to ten miles above the earth, but have been observed at a height of 15 miles, and the observer Hildebrandsson in Upsala observed such a cloud in a perfectly clear sky on November 24, 1894, at a height of over 80 miles and Mohn on December 19, 1892, measured the height of another seen above the North Sea as 79 miles.

It is well known that electrical measuring instruments, as well as telephones, telegraph instruments and especially radios are influenced by disturbances of cosmic origin. Less known is, however, the fact that the meteorological station on the observatory in Heidelberg in Germany has determined that such disturbances are connected with the appearance of cirrus clouds which are still a great distance from the earth.

Science admits that these clouds consist of very fine ice needles, which agrees with the claim that they are cosmic ice dust which has been blown out from a sun spot, has reached the earth, and is sinking into the earthly atmosphere.

Edwin Teale says in "Popular Science," February, 1934: "Streaming from the sun are large quantities of exceedingly fine, electrically charged particles. Some scientists call this moving mass solar smoke. As this stream of charged particles approaches us, it comes under the influence of the earth's magnetic field, and divides into two streams that diverge toward the two magnetic poles. Reaching the outer atmosphere of the polar regions, the particles often collide with the molecules of the air and become discharged, thus producing the beautiful display known as the aurora. The discharged particles, remaining suspended in the upper air, serve as the nuclei for the formation of the high, feathery cirrus clouds."

Since it is admitted that cirrus clouds are formations of very fine ice needles, the above paragraph practically corroborates the theory that ice-dust from the sun reaches the earth and causes electrical and meteorological phenomena.

These are surprising facts which throw a new light upon the science known as meteorology, or science of the atmosphere and the weather. This science has made great progress in the last few years, but here new paths are opened for it and of that we shall learn something in the next chapter.

There seems to be a deeper meaning in the ancient sun worship than appears at first glance. The ancients had a peculiar, direct knowledge of cosmic influences and knew perhaps more of the influence of the sun on human life and fate than we know today; but gradually we are becoming aware of some peculiar phenomena affecting the life on our planet, which are now attributed to the appearance of spots on the sun.

It has been known for a long time that there is a periodicity, a rhythm, in the appearance of the sun spots, that they appear with greater frequency every 11.2 years, and that the giant of the solar system, the planet Jupiter, affects by its orbit the activity of the sun in this respect.

The Academy of Science in Paris has published a report which shows the remarkable fact that the curve of the daily death rate agrees with the curve of the frequency of sun spots, and physicians have observed that rheumatic and neuralgic ailments are directly connected with the appearance of the spots on the sun. There is plenty of statistical material available which shows that they have direct influence on the human nerve cells and influence human behaviour, not only in the individual, but in humanity in general.

In other words, according to these observations the pulse of all life on earth reacts rhythmically to cosmic disturbances, caused by the activity of the sun. In times of great frequency of sun spots we may expect a large increase in certain species of animals and plants and we may even expect an increased nervous activity in the mass movements of human life, revolutions, wars, epidemics of murder and crime waves and other wide-spread upheavals.

The curve of natural disasters has also been charted according to observations and shows that the sun spot activity corresponds with the frequency of earthquakes, floods, tornadoes, and mine disasters.

This opens a large field for the competent and careful observer who is trying to prove the connection between the sun and life on this earth, for we are truly children of the sun and our home, the earth, is an organic part of the system over which the sun reigns supreme.

CHAPTER II

About the Weather, Especially Hailstorms

Everybody, said Mark Twain, is complaining about the weather, but nobody ever does anything about it. True enough, but what can one do about it? A great deal! First of all you may try to understand something about it! What causes bad weather, hailstorms, tornadoes, cloudbursts, rainy seasons, drouths? Is it possible to predict them with greater accuracy than is being done today, and where does the weather originate?

Weather is the most popular and surely the most important topic of all conversations, it is of the utmost importance in all human affairs and dictates the welfare or misfortunes, wealth or poverty, even life or death, for us human beings on this earth.

Not only terrestrial causes enter into the origin of the weather, but cosmic occurrences affect it and the general behaviour of the atmosphere. Only in recent times has meteorological science taken into consideration the activity of the sun and especially the connection between sun spots and weather. It astonished the scientists to observe a connection between sun spots and cirrus clouds and also between the appearance of large sun spots in the middle longitude of the sun, when the opening of the sun spot faces the earth, and the appearance of tornadoes and other destructive phenomena on earth.

It must be recognized that weather and cosmic ice supply are interdependent and that world-ice phenomena are the cause of all serious atmospheric disturbances.

If you enter into the study of the consequences of the ice-dust blast from the sun, you will find that the weather on earth is dependent upon it to a great degree. The influence of local atmospheric disturbances on the weather is, of course, admitted, but it plays merely a subordinate part. All more important atmospheric, magnetic, and meteorological disturbances can be traced back to the blast of ice-dust from the sun.

The earth is constantly bathed, so to say, in this fine ice-dust from the sun which carries positive electricity to the negatively charged earth, especially when on its orbit it traverses the "veil of ice." It causes the constant rain-fall in the tropics, which moves with the high stand of the sun, north and south, between the tropics. The tropics and somewhat higher latitudes get in this way one annual rainy period, while the equatorial regions have two.

The cirrus clouds, those fine ice clouds, float high above the earth, in altitudes where no air current can possibly reach them and no ice can be formed. They betray their cosmic origin also by their mysterious appearance and movements, which are independent of the rotation of the earth, their thin strata, and their partition in parallel bands.

Northern lights, luminous night clouds, and polar light bands are also due to the ice-dust blast from the sun.

Our last chapter treated almost entirely of the ice which reaches the sun from the far-away Milky Way.

Let us therefore still tarry a while on the subject of ice and see whether the Glacial Cosmogony can tell us something about the destructive rain of ice which so frequently causes terrible catastrophes on earth. Let us tackle the problem of hailstorms.

Only those who have witnessed a severe hailstorm can imagine the terrible destructive force which has been let loose in the region over which it breaks. On a beautiful summer day, when nature smiles and shows her loveliest face, a small dark cloud suddenly appears on the horizon. It approaches with great rapidity, a storm rises and all elements are in a furious uproar. Then the hail crashes down, enormous masses of it, like shots from heavenly machine guns, and in a short time it has passed, like a bad dream, if the wrecks of habitations and the complete ruin of fertile fields, orchards and forests were not witnesses to the frightful visitation. What is the origin of such a catastrophe?

Present day science explains the formation of hail without exception by the rising of masses of damp air, which cool off in higher regions and allow their water to freeze suddenly in the shape of drops. These drops, having become hailstones, fall to earth and are augmented by ice crystals from the cirrus clouds at a height of 25 to 30 thousand feet, until they grow to lumps sometimes the size of apples.

This explanation is clearly insufficient. The fact alone that there is no month and no hour of the day immune from hailstorms is not sufficiently explained; still less clear is the peculiar circumstance that most hailstorms occur after noon, around two in the afternoon, with the exception of two minor peaks at seven in the morning and nine in the evening.

There is also no explanation for the narrow and long path which these storms travel. Also no explanation why hailstones do not show the laminated structure caused by the addition of ice crystals which meteorology demands. And how shall such augmentation take place at the height of the cirrus clouds at a temperature of 150 to 200° F. below zero? Is not the cirrus dust there entirely dry?

We meet thus with physical impossibilities. The mass pressure needed for forming such bodies is also not in evidence. And calculate the length of time of the fall! It is hardly more than thirty seconds. At the beginning of the fall the hailstones must have formed and in a few seconds grown to their full size. Is that physically credible? Is not heat freed by the transition of water to ice, and how can the extremely low temperature of the hailstones be explained?

There seems to be a mountain of impossibilities in this explanation for those who are schooled to think technically.

Where does the violence of the storm before the hail-fall come from which has nothing to do with the state of the weather at the time? Wherefrom the gigantic amount of electricity in the thunderstorm? Wherefrom the annual and centennial rhythm of the hailstorms? And why are there two main zones for hailstorms on earth?

The honest answer is: The present state of knowledge in meteorology has no valid explanation for the origin of hailstorms or cloud-bursts.

There must be somewhere an unknown factor in the calculations which would clarify the entire problem and we shall look for it in the teachings of the Glacial Cosmogony.

If we now take a look at the illustration, an artist's drawing of the solar system rushing through space, encircled by the ice masses of the Milky Way, we see that all planets pass through the "veil of ice" streaming to the sun. The earth passes it four times a year, as I explained in the last chapter. This has, of course, an influence on the weather.

During September and the first half of October the earth is in locations free from ice and meets few ice bodies, and consequently these months bring us beautiful weather and one sees but few shooting stars. In December and January the earth is again beyond the ice veil, and only the ice-dust blown out by the sun will reach us in considerable quantities, because the earth is then nearest to the sun in its orbit. It is clear that the earth in its flight must meet with a number of ice bodies which come within its gravitational field on their way to the sun. What then happens may be of grave consequence for the inhabitants of our globe.

A body of pure ice, perhaps 30 to 300 feet in diameter, wandering through space on its long way from the Milky Way to the sun enters the gravitational field of the earth. Deflected from its path, it will revolve around the earth, in a spiral outside of the atmosphere, and will then fall and penetrate into the earthly envelop of air in a slanting direction with the full force of its planetary velocity. The air acts like an elastic cushion, slowing the speed of the body and increasing its temperature on its surface by friction. But as the ice block arrives at temperature of cosmic space and as ice is a poor conductor of heat, this heat will not penetrate far into the body; but the outer layers will detach in millions of ice chips and by constant

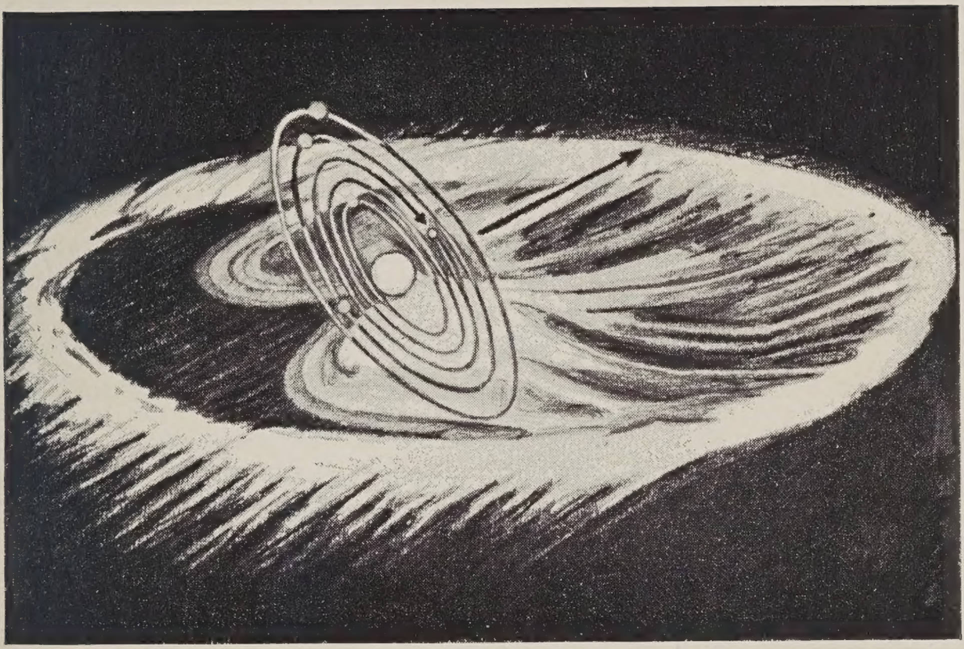

Fig. 9. An Artist's Drawing of the Solar System.

Seen from a cosmic distance our Solar System would present the appearance of a ring nebula, illuminated by a central sun. This illustration is also the work of an artist, not to scale, as otherwise the Milky Way would be much farther away from the system itself. It will serve to give the reader a general idea of the appearance of our system in space.

repetition of this process the block is broken up with incredible speed into a cloud of small ice fragments. We experience a *hailstorm.* The ice block, so to speak, drilled a hole into the atmosphere; its mass when broken into billions of chips must find a greater air resistance on account of its greater surface. But the kinetic energy of the original velocity has not been destroyed and the result is that the air is propelled in front of the hail cloud with the speed of a tempest. Those who are interested in mathematical calculations may read Note No. 1 about the breaking up of an ice bolide.

The resistance of the air to the ice cloud is 10,000 times as great as to the ice block and a proportionately large mass of air is set in motion—we have a tornado. It raises roofs, breaks trees like matches, and destroys whole cities in a few minutes. Such a catastrophe cannot be caused by the equalization of atmospheric layers from differences in temperature, moisture, or pressure; nor could these currents cause such phenomenal, sudden violence occurring in a circumscribed area only, which after its destructive work disappears again completely.

The greater part of the energy inherent in the bolide, moving with cosmic velocity, is not used for the heating of the ice, but for the compression of the air in front, causing the storm, and for the storage of electricity in the hail clouds. In the rear the cloud leaves practically a vacuum tunnel which is immediately filled by rotating gas masses which communicate their whirl to the air in front so that every large hailstorm is preceded by a violent whirlwind.

You see that here are phenomena which the technically schooled man recognizes at once, but which the meteorologist has almost neglected. Instead of changing the energy, freed by the impact with the atmosphere, into heat at once, it is used to set in motion the surroundings of the hail cloud. Only after the hail cloud, still almost of the temperature of space and highly charged with positive electricity, has reached the lower atmospheric layers begins the further heating of the sharp ice splinters and the visible cloud appears to the human observer.

At this point begins the melting of the ice fragments, which are rounded off and become smaller, and the vaporizing of the water into the high, dark, far cloud which announces to the mariner the coming storm. Soon the cloud comes lower and nearer and the storm breaks.

Hailstorms have certain characteristic features which corroborate the cosmic origin of these phenomena. They generally follow a straight path, such as a cosmic body entering the atmosphere would follow, with a width of about six miles, whilst the length of the path is from sixty to six hundred miles. They never change their direction from the point of appearance until the supply of ice is exhausted. I have already mentioned their sudden appearance out of a cloudless sky and their just as sudden cessation when the speed of the storm has passed a certain point. Another feature is the enormous amount of ice and water which is precipitated on the earth and the unusual cold of the hail stones; they create a burning sensation on the hand when picked up.

All these characteristic features point with certainty to a visitor from outer space; no other hypothesis will meet all of these requirements.

Let us consider a few of the severest hailstorms of which a record has been kept. On July 13, 1788, France was visited by a hailstorm which extended from the south of the country through Belgium into Holland. The entire width of the path was about thirty miles and the length more than six hundred miles. The peculiar feature of this catastrophe was that two hailstorms, one about eleven miles wide and the other six, ran parallel to each other, separated by a zone of rain. But of far greater violence was the storm which devastated Russia on May 27, 1834, from the Baltic to the Black Sea, over an extent of fifteen degrees longitude and ten degrees latitude. It was possible in this case to calculate the speed of the storm which averaged fifty-six miles an hour. Hailstones broke through the thatched roofs of the barns, the larger cattle on the field were wounded and thousands of sheep were killed outright. When the hail had melted, the fields were covered with slain birds and much small game.

A hailstorm over Vienna in the morning of June 7, 1894, shows what enormous amounts of ice may fall. In the center of the city there was a precipitation of hail, amounting to almost two hundred pounds for the square meter. Vienna resembled a city after a bombardment; more than a million windows were broken, trees lost their foliage, and in the evening there were still piles of ice in the streets more than man-high.

Hailstones of considerable size are also reported. Wachner, in his book on "Theories of the Origin of Hail," mentions that in India hailstones fell of the size of elephants. He ascribes this to the fusion of the hailstones. Indian officers who broke up such blocks froze their fingertips in touching the ice blocks;

—a proof of the unusually low temperature in the interior of the blocks. Darwin also tells of hailstorms with great lumps of ice but does not offer an explanation.

African explorers describe sudden severe rainstorms in the center of the Sahara desert, and caravans seeing certain death from thirst before them were saved by such an unusual phenomenon. The catastrophe which happened at Wadi Urirlu in April, 1899, should also be mentioned. A military column under General Redoya, consisting of fifty soldiers, was on a march in the desert when they were suddenly surprised by a tremendous cloud-burst. In a few seconds an area, one-half mile square, was six feet under water and six of the soldiers lost their lives in the flood. Where could such an amount of water come from? The desert is, of course, so hot and dry that the water rarely reaches the ground, but is absorbed by the air. But the accompanying storm makes itself felt and those who have seen a tropical sand-storm approaching in a narrow path will readily understand how this sudden tornado originates.

But the records of such catastrophes are very numerous and you need only read of storms, such as the one which broke over Florida in September, 1926, and note the details which a trained observer gives, to be immediately impressed with the conviction that such storms are due to cosmic causes and that the incredible energy expended cannot originate from atmospheric disturbances on earth. For in these whirlwinds and tornadoes is liberated in a few seconds an amount of energy, equal to the work of millions of horse-power for days. All the energy inherent in the human, animal, and plant life on the whole earth is not sufficient to supplant the energy of a cyclone, lasting perhaps only a few seconds.

It is impossible that such effects can be produced solely by the heating of the atmosphere through the rays of the sun.

But, frequent as these unwelcome visitors are, there is another cosmic disturbance influencing our weather which is constant and never absent, and that is the blast of ice-dust from the corona rays of the sun which strikes the earth without cessation.

The earth is, as we know, surrounded by a mantle of gases which extends to a height of about 400 miles around the globe. The layer next to the surface is warm and damp and consists mainly of nitrogen and oxygen. Above it lies a cold and dry layer, with nitrogen as the prevailing constituent which thins out more and more into hydrogen.

These upper layers of the atmosphere are saturated with this ice-blast from the sun, fine ice-crystals or needles of almost microscopic size but having a great velocity. Their small size prevents them from penetrating even the uppermost, thinnest regions of the atmosphere. The fine hydrogen layer just moves away under the blast, to the sides and forms here a ring-wall, the so-called passat-wall, around a depression. The lower layers feel the release of pressure and expand upwards. The barometer falls.

If the supply of ice-dust is very copious, then we find that fine cirrus clouds will flow off from the depression to all sides. After a few hours this ice-dust accumulation will have sunk into the lowest layers of the atmosphere and reach a region which is sufficiently warm to change the ice-dust into water vapor and finally condense this into water. The consequence is a general, far-extending rain on earth, but no cloud-burst, no hail, no local storm.

We see now why exceptionally dry years occur now and then. The supply of ice to the sun is disturbed by the large planets and consequently less ice-dust reaches the earthly atmosphere than usual. The opposite condition will prevail, if no disturbance takes place and the sun receives great masses of galactic ice.

Now you see how, aside from catastrophes, the weather on earth is influenced by cosmic conditions. It is impossible to go into details within the scope of this book, but those who are interested can easily get information from the works mentioned in the bibliography.

CHAPTER III

VAGABONDS AND LOST SHEEP OF THE SOLAR SYSTEM

AGAIN I shall take you out at night under the starry sky—people who would know about the universe must look into the infinite spaces. But this time it is probably a matter of waiting patiently, unless you choose the time, when the earth sails through the veil of ice going to the sun. The best time would be about the 15th of August. If the sky is clear and you have a free vision you will see suddenly a star, appearing very bright, shoot silently across the sky and leave a long flaming tail behind, which quickly vanishes. A shooting star! And at the time indicated you may see perhaps a dozen during an hour.

They are usually called meteors and swarms of meteors, but there is a vast difference between a meteor and a shooting star. First of all, the shooting stars are silent, while meteors can be heard and at times are accompanied by violent explosions and falling fragments of matter.

There is no doubt as to the fall of meteors; there are well authenticated reports in ancient times, in the middle ages, and in the modern age, speaking of a hail of stones and pieces of iron from the sky. And yet there was a tendency among scientists about the middle of the 18th century to deny the possibility of bodies falling from the sky and to relegate all such reports to the realm of fable and imagination. They went so far as to discard valuable meteorites from collections, since to them the idea of their origin was contrary to the laws of nature. When the Municipality of Juilac in France sent to the Paris Academy a report carrying 300 signatures attesting to the fall of stones from the sky at 9 o'clock in the evening of July 24, 1790, the Academy considered it highly amusing that such nonsense should be made the subject of an official report.

Today nobody doubts the cosmic origin of meteors, and when a fall of meteors is reported, expeditions are sometimes sent out in the hope of finding some of the fragments.

Meteoric fragments have frequently been found after the explosion of a meteor, and it was observed that their surface had been molten by heat, while the interior had remained cold and the crystalline structure showed no change which might have pointed to an effect of heat. It was asserted that the bodies, falling on the earth and accompanied by loud concussions, fire and a hail of fragments of metallic or mineral nature, were real meteors, and that the swarms of luminous bodies which were seen in the sky were also meteors, being merely of smaller size, so that they vaporized in the air and never reached the earth. These were called "shooting stars."

This idea, especially as to the small size of these bodies, is however erroneous, for shooting stars are radically different objects from meteors. They are rather large bodies of pure ice, and they appear luminous, not because they are incandescent, but because they shine, as do the moon and the planets, in reflected sunlight. They are far beyond any contact with the earth's atmosphere. This will surprise many, but it becomes plausible if we look into the matter a little further.

An ice block which is wandering from the borderland of the solar system may go either straight to the sun, or, having been thrown out of its course by a planet, will reach the sun by a detour. This road may lead it into the neighbourhood of the earth, and if the body is large enough to be seen in the night as one illuminated by the sun, we may get a glimpse of it in passing. A large body can be seen at a great distance, smaller ones when they have come nearer.

Shooting stars disappear sometimes at the time of their greatest brightness and on the other hand appear suddenly in the sky very bright and disappear getting gradually dimmer, and this phenomenon needs an explanation. We know that at night the sun illuminates the opposite side of the earth leaving us in the shadow. This earth shadow points like a long arm into space and we know from our school days that it causes the eclipses of the moon. The sudden disappearance of a shooting star is exactly the same phenomenon as an eclipse of the moon. The ice body shines in the reflected light of the sun only and becomes invisible to us at the moment when it enters the shadow of the earth. In the same way it appears suddenly when emerging from the earth shadow. The paths of these bodies in relation to the earth shadow have been carefully computed and charted, but we had better omit these complicated details which are too difficult for the average reader.

Objections to this explanation of the shooting stars were made by Professor Prey, the director of the observatory in Prague, a man who ought to be careful of his statements in matters astronomical. Professor

Prey held forth one of his own observations which clearly proved that shooting stars were also visible within the earth shadow, which is, of course, impossible if they are seen by reflected sunlight. Most objections to the Glacial Cosmogony by professional astronomers are based on this observation and a similar objection was voiced to me by a local astronomer.

But none of the objectors had taken sufficient pains to check up on the claim of Professor Prey or they would have found that the place from which Prey made his observation must have been located 15 degrees south of the equator, which is, of course, impossible for the city of Prague in Bohemia. The calculations of Professor Prey were erroneous.

If a large ice block comes near enough to be caught in the gravitational field of the earth, we may have a catastrophe, as we read about in the chapter on hailstorms. But if it is just a straying wanderer, passing the earth with cosmic velocity, we shall see it in the moonless night as a more or less luminous band, as if a star were in rapid motion across the sky. Sometimes the band begins as a narrow tape and widens up to the time of its disappearance. Now and then shooting stars of crescent shape or plainly rectangular shapes have been observed.

The explanation of these phenomena is not difficult. If a round ice body is so large that we could refer to it as a diminutive moon, it is subject to the same rules of illumination as the moon itself, and it is quite possible that a keen eye may see such a half-illuminated ball shooting across the sky in the form of a crescent. There is no reason to suppose that every ice block must be spherical in shape. It may be a fragment of a huge bolide, having flat surfaces. In the right position to the sun and the observer, the shape of the surface may be seen, and such observations are not at all self-deceptions, but must be regarded as actual.

The comets cannot be properly called vagabonds, because they do not roam at random through the solar system, but have very definite paths or orbits. Everyone perhaps has opportunity to see at least one of these remarkable celestial bodies in his life time and the sight is truly inspiring. No wonder that this bright star, with the sword-shaped tail streaming behind it, spread superstitious awe and fear in former times and was considered a sign of the wrath of the gods, portending war and death and pestilence.

In truth, they are quite harmless objects; even a collision with them would do no damage to the earth and we are said to have passed through the tail of a comet without noticing anything unusual.

The principal characteristics of a comet are the head and the tail. Every comet has a so-called head, the tail appears only when it comes so near to the sun that the radiation generates heat, detaching very minute particles which reflect the sunlight and consequently appear luminous. The exact nature of the material of a comet is still suppositious, direct observation having given no conclusive information. But it is certain that it does not consist of a compact mass of material, but rather of loosely connected particles which travel in space in close association. They probably consist of frozen gases and vapors, of the nature of which we get an idea only when they are so near to the sun that the ensuing heat makes their spectrum recognizable.

But few comets come so near to the sun. The majority remain at such a distance that no spectrum of self-luminous gases can be detected, and the others are so at variance with one another that no rule can be established. The only definite observation is that we see reflected sunlight together with a mixture of unknown substances. Among these bodies, however, there must be some which consist of ice.

In favor of this assumption is the fact that no comet shows a tail when at a great distance from the sun. This appears only after enough heat has been developed to cause vaporization, and no material vaporizes as readily as does water.

Hoerbiger maintains, for reasons which cannot be elucidated here, that all normal comets originate from ice accumulations of the trans-neptunic zone. Let us suppose we have such a body before us. If vaporization takes place, the vapor must be steam. But we know that it cannot be steam in our sense, because in the cold and practically vacant space, water cannot pass from melting ice into liquid form and then into steam. But a process takes place which is called "sublimation." The ice changes immediately into fine ice-dust and it is this ice-dust which surrounds the head as a so-called "coma," and is later driven behind the head as a tail, by the pressure of sunlight.

These are the main features of a comet. We must consider the head to be an accumulation of bodies, consisting of material which, under sufficient heat, can form vapor. It is of less importance to know whether this vapor is solid nitrogen, frozen carbon dioxide, or the like. The mass which forms the head must be so light that it cannot hold these vapors by force of gravitation, otherwise we could never see these long tails of various shapes, but only a luminous kernel surrounded by a vapor. This is in fact the state of the comet as long as it is still such a distance from the sun that the radiation pressure cannot detach the vapor from the main mass and form it into a tail.

On the whole, the comets still belong to the unsolved riddles of the universe, but there are strong reasons supporting the theory that comets are ice bodies, suffused with other matter in fine attenuation, loosely coherent and of small mass. The tail consists of particles of ice-dust, separated from the head by the heat of the sun and driven away from the sun by radiation pressure, becoming luminous in the reflected light of the sun.

PART III

THE STRANGE STORY OF THE MOON

CHAPTER I

About Moons in General

Astronomy is usually considered the most exact of all branches of science, because it deals with intricate mathematical calculations. It seems rather strange under these circumstances that the nearest celestial body, the largest and most conspicuous to our eyes and the one that is companion to the earth, should present the most disagreeable and difficult problems to the astronomer. But this is nevertheless the case. And it is not only our own moon that makes things so difficult, but the moons of other planets—and there are quite a number of them—present sometimes unfathomable riddles. They do not seem to fit into the general cosmogony of Kant-Laplace and are sometimes so discourteous, as to contradict it flatly.

There is the pertinent question: Where did the moon come from? A number of theories have been advanced. One of them claims that the moon once formed part of the earth, but was torn off by some mysterious force and thrown an enormous distance away, exactly to the position which it occupies now. The hole which it left in the earth is now supposed to be filled by the Pacific Ocean. It is not necessary to point out the absurdities of this wild theory.

From time to time new moons of Jupiter and of Saturn have been discovered by photography. They are supposed to be arrivals out of space, attracted by the large planets and by them made satellites. If they were the products of centrifugal expulsion, their orbits should lie, for purely mechanical reasons, in the plane of the equator of the mother star. But to this requirement they do not at all conform; sometimes they even move in an orbit opposite to the normal direction, and the planes of the moons of Uranus and Neptune show still more peculiar deviations. They can, therefore, not be parts of an equator ring, thrown off centrifugally from the main body, but must be rather foreign bodies attracted from cosmic space.

When I say cosmic space, however, I must modify this statement somewhat. These stellar bodies do not come from outside the solar system, they were not wanderers in the infinite universe, but are respectable members of our own system, revolving in the borderland, far outside the orbits of planets, or they were small independent planets which came under the gravitational influence of a larger one. How do such events take place?

All bodies, large and small, revolving around the sun, would always keep their same orbit and distance from the sun, if there were no disturbance to change it. But we know that there is in space a very fine resisting medium, for convenience called the ether, but really an atomically fine hydrogen gas. The planets move in almost circular ellipses, because the gravitation of the sun draws them towards it and their inertia, corresponding to the force of a once imparted impulse wants to drive them away. They are therefore under the influence of two conflicting forces, the one attracting it to the sun center, called centripetal force, and the other driving it away, called centrifugal force. As long as no other influence comes into action, the forces remain constant and there cannot be any possibility of a change of their motion. It would go on eternally and nothing would ever happen.

But there is the resisting force, however insignificant, of the ether. It must gradually weaken the driving force (centrifugal) and strengthen correspondingly the attracting or centripetal force.

The orbit of a planet must become smaller, as it is drawn nearer and nearer to the sun and from this shrinking of the orbit results an acceleration of its motion. Light bodies will be affected to a greater extent than heavy ones by this ether resistance, the latter having a greater force of inertia; the former will for this reason diminish their orbit faster than the latter, and although no decrease of the time of planet revolution has been observed in historical times, it is bound to become noticeable in the course of cosmic time.

Let us take another step. The sun stands still only for our world system. Considered as a fixed star, it has a motion of its own which leads in a straight line to a point in space called its apex point. We are speaking of the "translatory motion of the sun" and on this journey through space the sun carries the entire army of its satellites, the earth and the other planets, the comets and all minor cosmic bodies, meteors, shooting stars, along with it. Every planet has therefore, aside from its revolution around the sun, a forward motion through space with the sun, and if their distances from the sun did not change, the path of the planets would be spirals on the surface of a cylinder.

The path of the sun, considered as a straight line, would be surrounded by as many cylinders as there are bodies which revolve around the sun, one always inside the other. But if, as we maintain, the orbits of the planets shrink, then these cylinders become elongated cones and the orbits of the planets become spirals on their surfaces. The orbits of the four inner planets are illustrated in Figure 10, and we observe that they get narrower from left to right, following the direction of the motion of the sun through space. The orbits of light bodies shrink faster than those of the heavy ones, because the latter are not so much influenced by the resisting ether, their inertia being greater. Each body will, therefore, change its orbit around the sun according to a certain rule.

This relation of ether resistance to weight and speed of revolution of a body is called by Hoerbiger the "coefficient of orbit shrinkage." Of course, Hoerbiger, writing in German, has a much more elegant word at his disposal instead of the four words of my translation; he calls it simply "Bahnschrumpfungskoeffizient," and you are at liberty to substitute it, if you prefer. It has a definite value for every body revolving around the sun. If this coefficient is set equal to 1 for the earth, we find the following values for the smaller planets:

Mercury = 2.30, Venus = 1.27, Earth = 1,
Moon = 5.70, Mars = 2.65.

These figures have been calculated according to certain premises; not their absolute values are essential, but their *ratio* only is important, because it indicates the amount of shrinkage of the orbits of the other planets, compared with that of the earth.

What now is the consequence of this shrinking of

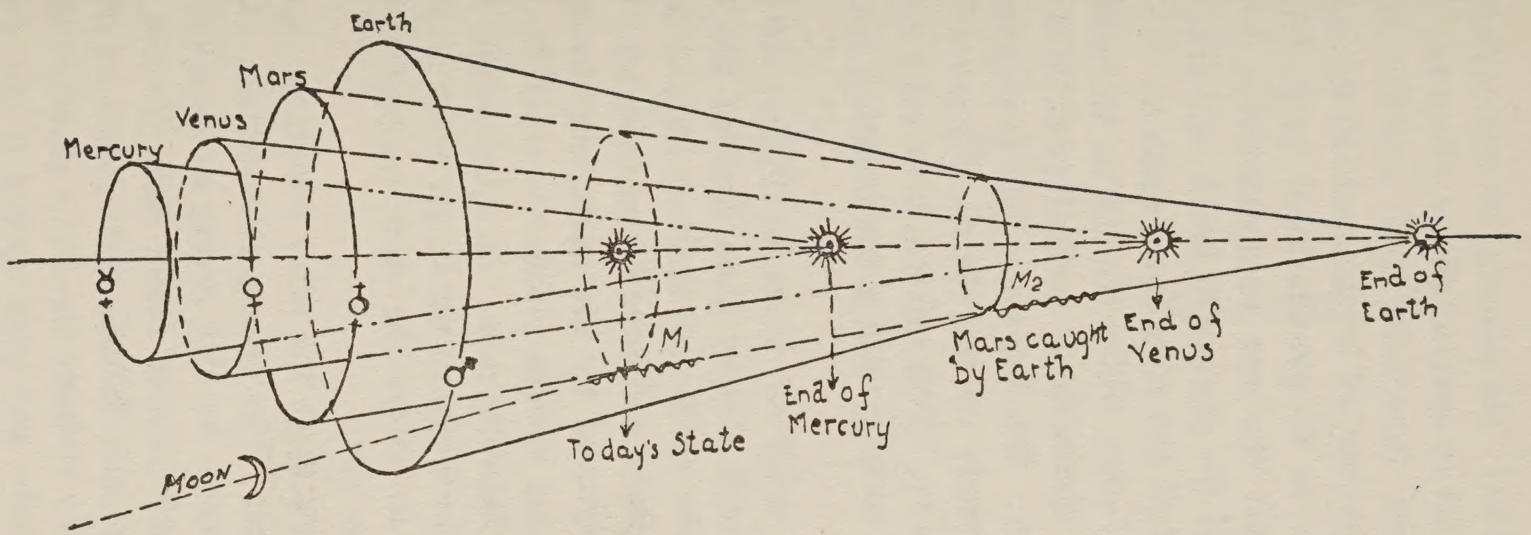
Earth
Mars
Venus
Mercury
☿
♀
♁
♂
MOON
M$_1$
Today's State
End of Mercury
M$_2$
Mars caught by Earth
End of Venus
End of Earth

FIG. 10. THE SHRINKING OF THE ORBITS OF THE INNER PLANETS.

The cones in this drawing are shown so obtuse that the shrinking phenomena can be clearly followed. The path of Mercury is close to the sun and the planet is the first to reach the sun. At M_1 the position of the earth at the present time is indicated and the path of the moon is shown before its capture by the earth. After the absorption of Mercury by the sun, Mars has approached so near to the earth at M_2 that it is captured as satellite. At this time our present moon has already become a part of the earth. Then comes the end of Venus and finally the end of the earth.

the planetary orbits? *All planets are approaching the sun in a spiral path in various ratios of speed.*

Mercury is the innermost and smallest of the planets and, on account of its nearness to the sun, the one most subject to its gravitational force. It will therefore approach the sun comparatively fast and will be the first of the planets to break into fragments before the huge ball and rain down upon it.

Then follows Venus, whilst the Earth, travelling on an only slightly diminishing conical path, will meet its fate much later. But the same fate is in store for all of them. A study of the sketch, Figure 10, will make this very clear. You can see how each orbit is gradually getting smaller until a combination with the sun is inevitable.

But study the orbit of Mars in Figure 10. Its conical path is much steeper than that of the earth and long before the earth has reached its end of the journey, the two paths will have intersected, and Mars will have been captured by the earth and forced to form with it a binary system, similar to what the earth and the moon are forming now. In other words Mars will have become the moon of the larger earth and have been absorbed by it, before the earth reaches its final resting place in the sun.

The outer planets meet the ether resistance equally with the inner ones. The strongest resistance will be experienced by Saturn, its ring acting as an open sail, and it will approach Jupiter faster than Uranus, for instance, could approach Saturn, and become its moon. Jupiter will probably embody the three planets outside of its orbit gradually and then approach the sun in lonely grandeur, but long after the earth has found its last resting place in the body of the sun.

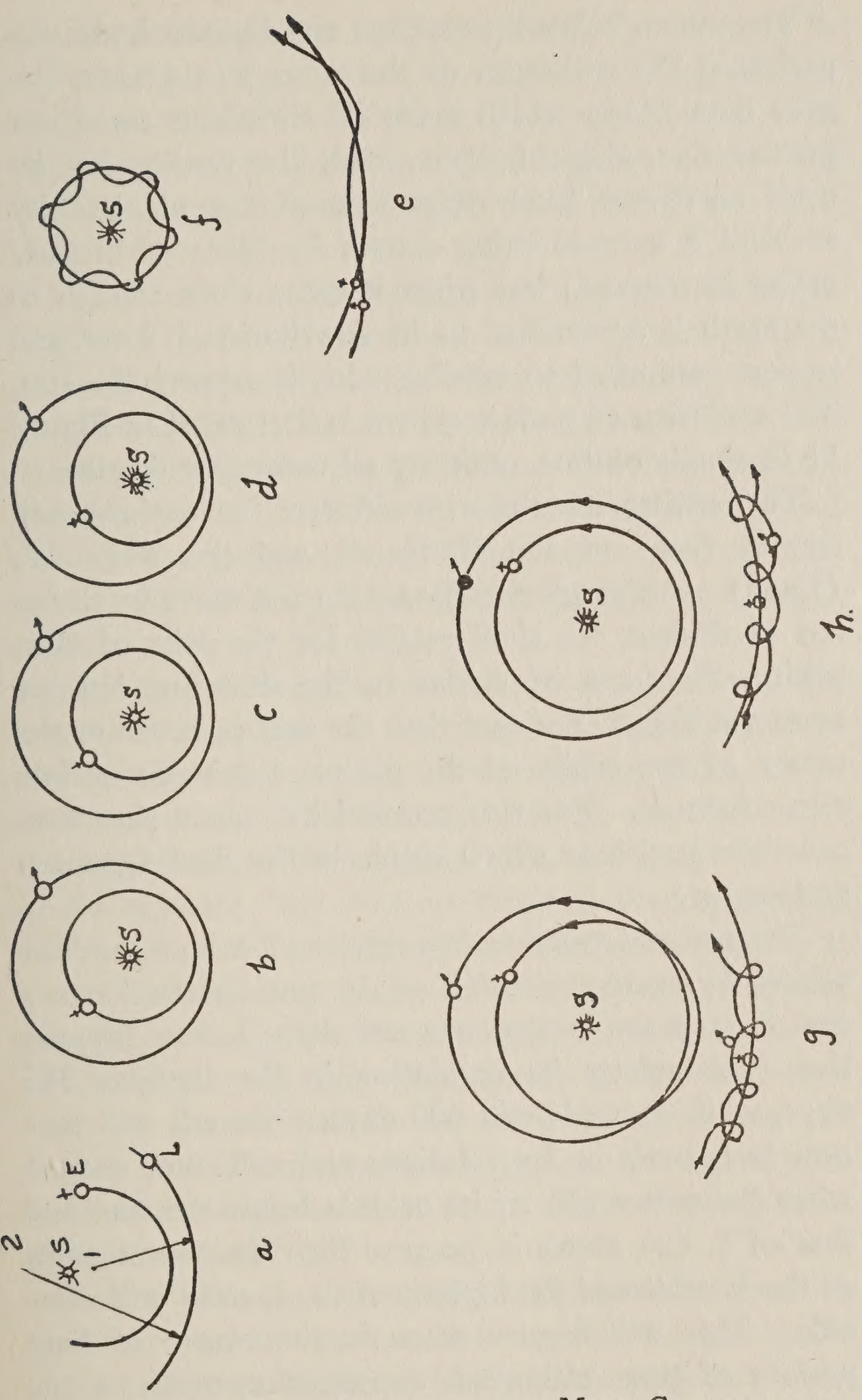
2
S
1
E
L
a
S
b
S
c
S
d
e
S
f
S
g
S
h.

Fig. 11. The Mechanics of a Moon Capture.

The moon, being the smallest and lightest body, experienced the resistance of the ether to a greater degree than Mars, which made its shrinking coefficient greater than that of Mars, with the result, that its orbit narrowed faster than that of the planet. By accident it escaped being caught by Mars when their orbits intersected; but when it came close enough to the earth it succumbed to its gravitational force and is now compelled to revolve with it around the sun. The evolution of such a system is illustrated in Figure 11 in simple outline, omitting all confusing details.

Two arbitrary paths with different inclinations may signify those of the Earth—E and the Moon—L (Luna). Although the planets do not move in circles but in ellipses, we shall retain, for the sake of simplicity, the form of circles in the drawing, but we must not forget the fact that the sun is never in the center of the orbits of the planets but more or less away from it. For this eccentricity causes the characteristic positions which result in the final approach and capture.

The sun is located in the center of a in Figure 11 whilst the centers 1 and 2 of the two planets E (♁) and L (♂) are located eccentrically. Let us suppose that E completes its revolution in the familiar 365 days, while L needs still 600 days. Then E will pass near to L twice in 3 revolutions and will come nearest when the center (1) of its orbit is below the sun, and that of L (2) above it, because then the lowest point of the E orbit and the highest of the L orbit will coincide. This will happen often in the course of long periods of time without L experiencing much of the influence of E. In the course of time, however, the radius of the orbit of L will diminish through the ether-resistance faster than that of E, as shown in b, c, and d of Figure 11. In this way L approaches nearer to E, and in the illustrations we see that L in this important position is always nearest to the sun, so that the gravitational forces of S and E are combined.

In this manner a strong gravitational pull is brought to bear upon L. We see now, how from one position of nearest approach to the other, which may happen in intervals of hundreds of thousands of years, the orbits approach more and more. We feel that the deciding moment will come, when the smaller L will make a sharp turn toward E and enter into an orbit around E. This has been illustrated at e on a larger scale.

The smaller body has now been captured and has become a satellite of the larger one and revolves around the latter in the familiar moon orbit, as illustrated at f. The direction of the revolution depends entirely on the position of L and E at the time of the capture. The new satellite can have apparently either a forward or backward revolution, as shown at g and h, depending simply on whether, at the fateful moment, the captive was outside or inside the orbit of the planet; to this circumstance is due the directions of the revolutions of some of the moons of Jupiter and Saturn, which seem to be contrary to normal, as was shown with the help of the photographic camera.

This has been known longer in the case of the moons of Uranus and is most conspicuous in the case of the moon Triton of Neptune, whose plane is almost vertical to that of its planet. And still another peculiar fact in connection with the orbit of this moon. If we extend its polar axis, which must be vertical to the orbital plane of Neptune, into the infinite, then the northern end of this line points directly to a location between Lyra and Hercules, which is at the same time the apex point of the translatory sun path. We suspect the importance of this fact, but we must first investigate and learn how such an orbital plane could originate.

Neptune's moon is a small, light body still under the gravitational influence of the sun, but not under that of Jupiter. It revolves around its planet with great speed and, as it belongs to the family of the sun, is forced to take part in the translatory motion and in this way encounters the ether resistance. Outside of this resistance and the gravitational force of its own planet no other forces have any influence on it.

On account of its small size and rapid revolution it feels strongly the ether resistance, so that it tries to adjust its orbit faster vertically to the translatory direction of the sun, which it parallels in its flight through space. You will remember the illustration with the light hoop and the lead ball in its center and its tendency to erect itself in flight against resistance.

The consequence is that the pole of its path, outside of a small disturbance, occasioned by the orbit of Neptune, points to the same direction in which the sun is moving, namely to the apex point. The simple solution, which is the result of thinking out to the end the problem of the gyroscope and the shrinking of planetary orbits, has been known to science since the publication of Hoerbiger's book, but its great importance for the determination of the sun apex has either not been recognized or has not been sufficiently appreciated, although this discovery alone should be sufficient to call serious attention to Hoerbiger's theories.

Regular measurements and observations of the small divergences of the motion of the pole of the Triton path, and the fixation of the curve during a Neptune year, which according to Hoerbiger must be a slim figure eight, would prove that the apex of the sun must lie exactly in the intersection of the curves. The position of the plane of the orbit and the direction of the rotation of the moon of Neptune is therefore no "anomaly," as astronomers have until now maintained, but the only true compliance with the law governing the path of a moon, which, free from all other influences, follows solely the motion of the sun under the influence of ether resistance. I have allowed a good deal of space for the explanation of this phenomenon, because it will show that in the theory of the genesis of moons I have not shirked the discussion of this hitherto unsolved problem.

Although it does not belong to the subject of "orbital shrinkage" I shall, for the sake of completeness, give a short account of the place of origin of the bodies outside of Pluto; also how they reach the interior of the solar system.

We have seen how, at the origin of the solar system, a part of the ice masses escaped from the gravitational field of the sun and now forms the freely visible Milky Way. But another group of similar bodies was detained outside of the orbit of the last planet, but still within the gravitational field of the sun and revolves around the sun as a ring of transplutonic planetoids.

This ring could not comply with the plane of the ecliptic, because the influence of Jupiter does not reach so far, and its medium plane of revolution shows a considerable angle to the orbit of Jupiter. We therefore find two intersections of these planes, which lie at 90 and 270 degrees of the section of the ecliptic plane. If we assume that from this trans-plutonic ring some individual members are moving toward the sun under the law of orbital shrinkage,—of course in spiral rings and not in a direct path!—we can see, without difficulty, that they might meet Neptune at the intersection points if this planet happens to approach this point of its orbit at this time.

The consequence would be that such a body is captured by Neptune's gravitational force, or, at least, thrown out of its path. In the former case Neptune will have acquired a new moon, in the latter the planetoid will continue in its disturbed path and may on its road encounter Uranus, Saturn, or Jupiter, and be held by them as satellite, or reach the ring of Asteroids revolving between Jupiter and Mars. From here it may continue its journey toward the sun, a matter which however does not interest us at the present time. But as it approached Neptune, as we know, in an angle to the ecliptic, it could not in the beginning revolve in the normal orbital plane. Here it follows a law of all bodies which are attracted by planets in this way and made satellites.

This again proves the importance of applying mechanical laws in the explanation of cosmic "lawlessness" and anomalies in the motions of moons. If such a trans-plutonic body should, however, be of an especially light and loose structure, and for this reason avoid the attraction of the large planets better than heavier bodies, it would retain its deviating orbital path still longer and approach the sun in a long elliptical orbit as a so-called comet. This explanation of Hoerbiger's furnishes the key for the observed fact that most comets enter the inner field of the solar system at 270 degree ecliptical longitude and that their aphelion must be looked for in that location of sidereal space.

From still vaster distances than the trans-plutonic zone of planetoids, ice bodies are travelling towards the sun; and those which come near enough to the earth to become visible are called shooting stars. They originate in the Milky Way, the ring of ice bodies, which is visible with the naked eye, in contrast to the galaxy of small stars which can only be seen with the help of telescopes. Such bodies are not governed in their flight by the shrinkage of planetary orbits and have nothing to do with the discussion of these problems; they may be ignored for the present whilst we turn our attention to the largest of the bodies ever captured by the earth, the Moon.

CHAPTER II

The Satellite of the Earth

In the case of our moon, the secular acceleration of its mean motion has been a bone of contention among mathematical astronomers for some time. Halley found, by a comparison of ancient with modern eclipses, that the month is certainly shorter than it was in the days of Ptolemy, and that the reduction has been progressive, apparently going on continuously. In one hundred years, according to the results of Laplace, the moon gets in advance of its mean place about ten seconds, and the advance increases with the square of time.

The moon originated outside of the orbit of Mars as the outermost of the inner planets. Its development could not have been much different from that of Mars, and its surface will have resembled that of Mars in those early stages. The first great destructive force would have been experienced by the moon's envelope of ice when it was in danger of being captured by the stronger Mars at the intersection of their orbits. The moon was able to escape this fate, but the effects of the flood on its envelope of ice in the danger zone must have destroyed it in all directions and created a mass of floes which slowly froze again to solid ice.

This could have taken place in the long period of time after its escape from the dangerous neighbourhood of Mars and when it revolved again as a still independent planet for eons between Mars and the earth, subjected only to the effects of the tides created by solar attraction. Disturbances of a greater order than now occurring on Mars could hardly have acted on its surface in those times. When, however, in the course of time the orbital shrinkage brought it nearer to the earth, and the process of capture initiated floods of constantly increasing force at every approach of the two bodies, the ice envelope must have suffered severe disturbances in its structure.

When the moon was finally captured and made a satellite of the earth a catastrophal destruction must have resulted. During this stage of development, before both bodies had adjusted their orbits to the new condition, the fundamental displacements of the ice floes must have occurred, the piling-up of ice masses and the formation of ice mountains, which today give to the moon's surface its characteristic appearance. They retained this formation because the core of the moon was cooling down gradually due to its small mass, which also caused a slow freezing of the entire ocean. The envelope of ice constantly grew thicker and the structures on its surface became more resistant against later destructive forces. What we observe on the moon as more recent formations of various kinds belongs to the latest period, during which the water slowly disappeared so that only a dead, unchangeable desert of ice remained.

Even to the naked eye the moon appears as a disc with lighter and darker spots. With an opera glass a number of surprising details can be observed, large plains, craters and distinct mountain landscapes. It is readily understood that with the invention of the telescope the eyes of all astronomers and amateurs should have been turned to the moon and that in modern times the fantastical attempts at explanation of former centuries were replaced by more plausible ones.

A hundred years ago the presence of roads and streets on the moon was accepted as a fact. The craters appeared to many observers as fortresses and cities, built according to definite plans, and their circular shape was supposed to be particularly adapted to the imaginary life of a lunar population. These assumptions had to give way of course to the results of exact research, only, however, to be replaced by other new and contradictory hypotheses. But even these (I shall mention just a few) were based mainly on terrestrial conditions transferred to the moon, without examining whether such procedure is reasonably justified from a mechanical and physical standpoint.

The most obvious was always the volcanic theory. Because the earth has volcanoes,—the moon must have them also, and because Vesuvius, Etna, Pike of Teneriffa and others show circular craters and ash heaps and sometimes have central cones, the innumerable similar formations on the moon could be nothing else but such craters. But while the diameters of the larger terrestrial craters measure a few miles only, the craters on the moon, e.g., Copernicus and others, have sometimes diameters of sixty miles! This was simply explained by the fact that, as the moon has not the gravitational force of the earth, and therefore all objects on its surface are much lighter, the erupted volcanic masses must have been driven much higher than was the case on earth, and must have formed walls of débris of such magnitude when they fell back. It was even believed that volcanic bombs were propelled with such enormous force as to leave the attraction of the moon and enter the field of gravity of the earth, falling on the latter as meteorites.

Opposed to this theory of volcanic origin is the one which ascribes the formation of the round depressions, those without ramparts and also those with circular walls, to the frequent impacts of large meteoric masses on soft earthy ground. The adherents of the volcanic theory built very ingenious models of small artificial volcanoes, and when they caused molten metal to spurt out of an opening, it fell back like the spray of a fountain and hardened into walls, forming a structure which had great similarity to the lunar craters. One can also let steam penetrate through soft wax or plaster and obtain bubbles which after bursting look similar.

The advocates of the meteoric hypothesis also attempted to prove their case experimentally by letting weights fall on soft mud surfaces, and they also found that these impressions resulted in structures resembling the formations on the moon; light balls and dust-like material will bring a similar result! Formations were obtained by such and other means which really had a striking resemblance to those on the moon. But all these experiments take for granted that the moon shows today the same surface which it had when these formations originated by interior or exterior forces, and that the formations were preserved in the shape in which we see them today.

There is no doubt that immense eruptive and explosive events happened on the moon, when the molten liquid kernel was still in fiery combat with water; but even if it had had as little water proportionately as the earth has now, the enormous floods which happened when it approached the earth would have leveled the sharp ridges of the mountains. For the floods must have become stronger than on our planet, on account of the moon's lighter mass.

But—we are told—it has been held that the mountains of the moon are made of glass-like and slag-like material, and that such hard substance would withstand the battering of floods, and Professor Ebert of Munich made a very instructive experiment which he described in "Sirius" of August 1909, under the title, "Study of the Physical Condition of the Moon-surface." He illuminated a weather-worn and lightly dusted glass mass under various angles and at certain phases of lighting found a great resemblance to the dark places on the moon surface. Experiments with surfaces of ice would probably lead to a similar result, because the difference between old molten glass and hard ice cannot possibly be great.

It is somewhat amusing to read that American observers with their gigantic instruments believe they have seen ice on the moon; unbiased amateur astronomers with their small telescopes arrive sometimes quite naturally at the same opinion and remarks like "that looks just like ice, it resembles a glacier," or "it looks like broken ice" are often heard from people who are not yet familiar with the Glacial Cosmogony. To-day, however, we need not doubt the existence of ice on the moon; we maintain that the moon shows not only traces of snow at exposed spots, but that it is covered with a deep mantle of ice. Not only the glaciers and snow fields of high mountains reflect the sunlight, but all the various shapes and colors which we observe are due to nothing but the presence of ice; the mountains with their precipitous slopes are primeval, piled-up ice floes; the darker plains are new ice, smooth water surfaces later frozen over.

Hoerbiger is no longer the sole exponent of this idea; in the book, "The Wonder and the Glory of the Stars," by George Forbes, M.A., London, 1926, the ice nature of the moon is discussed at length.

How do we conclude that the moon is covered with ice? Every book on physics teaches that the albedo (that is the property of materials to reflect a certain percentage of the light falling on them) of freshly fallen snow, white marble, and white paper has approximately the same value. Some scientists deduced from this, because it seemed the most natural deduction, that the moon's surface consists of a white mineral, like plaster. But for the same reason one could say that it consisted of white pasteboard. We give the preference to ice and snow, although the albedo of the moon is considerably less than that of pure snow. This is firstly due to the fact that the moon is not uniformly white but shows gray, bluish, and even blackish spots, and secondly, which is most important, that it is not a disc-like surface but a sphere which, to us, appears uniformly illuminated, although we receive fully reflected light in our instruments from a small central portion only.

We therefore measure the average quantity of the reflected light and from that deduce the presence of a material which possesses a corresponding albedo. But even this average value cannot be considered as constant because of the fact, well-known to the careful observer of the moon, that the darker tints of the moon surface change under the influence of the sunlight; first they become paler, then darker, as they were when they emerged from the lunar night. To explain this phenomenon we must determine how the lunar ice behaves under the radiation of the sun. It will be necessary to become somewhat more technical in our explanation in order to satisfy the more exacting physicist and engineer; but I hope that the general reader will also understand this trend of thought.

We put the question: Why does the ice on the moon not melt in spite of two weeks exposure to the rays of the sun?

You may remember an experiment often made in school during the lesson in physics when studying the air pump. A thin tin vessel, thoroughly heat-insulated, was filled with water and placed under the recipient of the air pump at ordinary temperature. Then the attempt was made to create a high vacuum as quickly as possible in order to evaporate the water. The boiling point of water, as is known, depends directly on the atmospheric pressure. The experiment showed that only a small part of the water evaporated; the remainder turned into ice. This happened at ordinary room temperature. On the moon we have a much higher vacuum than we can attain with an air pump, since the pressure of its atmosphere (hydrogen) is so low that a barometer would register only fractions of a millimeter of the mercury gage.

At such a low pressure the boiling point of water lies probably at 0° F. or even lower. The ice can therefore never become water of 32° but will very likely evaporate or, expressed more exactly, sublimate at about 10° or 0° F. More technical and exact details are given in the book by Ph. Fauth, "Mondesschicksal." A calculation proving this point you can find under Note No. 2.

The figures show that if the surface of the moon consists of ice, the latter cannot melt; that it *is* ice is a fact for the adherents of the Glacial Cosmogony, a fact which will sooner or later be recognized by the scientific world. The ice on the moon can never turn into water; it may evaporate somewhat faster in those darker parts of the surface which do not reflect all the light but absorb a part of it and change it into heat.

A simple illustration will make this clear. If two pieces of ice, the one of frozen water, the other of frozen ink, are brought into a warm room, both will melt with equal speed. If, however, the two pieces are placed on a slab of ice during a cold winter day and exposed to the noonday sun, then the frozen ink will melt faster than the pure ice, because the dark color absorbs the light rays and partly transforms them into heat, while the white ice reflects the light, which consequently is not converted into heat.

This experiment offers a simple explanation for a phenomenon observed on the moon surface. In former times the dark ocean areas were capable of transforming a certain quantity of sunlight into heat, which changed the last remnant of water into vapor or ice-mist, or perhaps caused some of the ice on the moon to evaporate and become hoar frost. This hoar frost is still existent as a thin layer in the lower regions and will disappear only where the vertical rays of the sun cause sufficient heat on the dark icy background.

If such an area emerges out of the lunar night, it will at first appear dark, but not as dark as an area lying at the lunar forenoon; then it becomes somewhat paler but darkens again as it advances into the lunar noon. Entering the lunar afternoon the dark tone will again fade and disappear as a dark area in the lunar night, to emerge again from it fourteen days later in the same manner. The muddy gray color which we observe in such areas at the beginning of the lunar day and also in the evening is due to the shadows thrown by the figurations of the hoar frost.

The shadows are naturally longest in the lunar morning and evening, causing the general gray appearance; at noon and at the beginning of the afternoon they become shorter and cause a certain brightening of those areas. But under the vertical rays of the midday sun the hoar frost disappears entirely and then these parts of the oceans will appear at noon in their natural color, i.e., darkest. This mist, which cannot rise, is dispelled under the pressure of the sun's radiation and scatters in all directions, until it has escaped the vertical radiation, to places where it can settle again as hoar frost. At that place the darker ice surfaces will again appear somewhat lighter.

The objection may be advanced that during this process of evaporation and formation of hoar frost the moon should appear as if immersed in a cloud of mist. But this cannot happen because there is no envelope of gas to sustain such a cloud and the gravitational force of the moon holds these light structures close to its surface. If the gravitational force would not suffice for that, the pressure of the sunlight would drive the ice-dust to the shadowy side of the moon, where it would develop into the form of a comet's tail. As it is, it remains on the side turned towards the sun and here causes the temporary veiling of the oceans, some craters, and the inner areas of ring-mountains. The best known examples are noticed on the basin of the crater Plato.

At times the scientific speculation came very near to the truth of Glacial Cosmogony. Professor Young, a well known expert on the sun, has found that the infra-red spectrum of the moon shows rays of greater wave length than could be emitted by an ice block, and he concludes that the substance is one colder than ice. But should not ice of the temperature of cosmic space, even when heated by the radiation of the sun to 40° F. below zero, be cold enough to explain this phenomenon? Young evidently never reckoned with the possibility of having to do with ice or he would almost certainly have raised this question.

On the other hand, Scheiner asserts in "Populaere Astrophysik," 1908: "There is practically no atmosphere on the moon and consequently there can be no water, not even in the form of ice, because a heavy evaporation would result through the lack of atmospheric pressure. This statement is of importance, for the reason that according to Rutherford's stereoscopic pictures it is concluded that the *surface of the moon consists mainly of ice.* On these stereoscopic pictures the moon appears actually like an ice formation, but we have before us a stereoscopic illusion produced when the two sides of a picture are not of the same intensity or when many parts deviate from one another in this respect. The result is a peculiar flickering sensation which causes the illusion of ice."

At the time when the above lines were written, the possibility of the ice nature of the moon was utterly opposed, an opposition based on seemingly correct physical views, so that these stereoscopic pictures, which are in fact not even necessary, were said to cause illusions when they showed the formation of glaciers and icy plains. A good telescope pointed at the moon on a clear winter night is sufficient to convince any one, and many a layman exclaimed unconsciously: "But that is ice!" May it not be profitable to use the same mental acuteness which is required to find reasons against such a theory also for the purpose of reasoning in favor of the ice nature of the moon?

We have previously mentioned that the moon must have had an evolution similar to that of the planet Mars. As long as it was so far distant from the earth that the gravitational force of the earth had no influence on it, it was, like Mars is now, only under the influence of the sun, which caused slight flood phenomena on its surface. But we can imagine what violent changes must have taken place when the moon came nearer and nearer to the earth, at first still passing it on its orbit but finally succumbing to capture, being the lighter body of the two.

During its last two passages near the earth immense floods destroyed the ice envelope and piled up the broken ice blocks. At the capture the forces of these floods must have increased enormously and reached proportions during the adjustment of its orbit which surpass our imagination. In this way only can the chaotic structure of these mountainous floes be explained.

The moon has never resembled the earth. Even when it was still a planet it certainly lacked the peculiar atmosphere which the earth possesses. Gases could not rise to the surface through the deep envelope of water, quite aside from the fact that gases could not develop in any quantity from the gradually cooling interior. The thin layer of atmosphere which still surrounded it then was not sufficient to protect the surface against the cosmic cold or against the hail of cosmic projectiles which broke, and probably penetrated into, the ice envelope.

In these two forces—the one acting on the ice mantle from the interior, caused by the pressure of the water under influence of solar gravitation, and the other from the exterior by the meteoric bodies which bombarded the shell—we must find the cause for the formation of the moon's surface in a previous stage of lunar evolution. We now understand immediately that both the volcanic and meteoric hypotheses join, with the difference, however, that in the former aquatic floods, not seismic forces, are the cause, and that in the later hypothesis not a soft earthy mass, but ice, is the plastic ground into which the meteors penetrated.

If we consider the meteoric theory in connection with the lunar evolution at all, it has a place only during those periods of time when the moon revolved at such a distance from the Earth, between Earth and Mars, that most of the meteoric projectiles were not diverted from it by the gravitational force of the Earth, as must now be the case. The volcanic theory is more important to us, but only in so far as we can explain the lunar formations as caused by outbreaks of water, an explanation which depends upon an axial rotation of the moon. Without this rotation the uniform distribution of these peculiar formations over the visible surface of the moon would be an impossibility. If we disregard those far distant times in which solar attraction only caused the floods, and assume that the moon is already the companion of the earth, so that the terrestrial forces outweigh the solar ones, we get the following picture:

Somewhere in the ice envelope an opening was formed while the moon still rotated around its axis, and water broke out under the flood pressure which spread over a more or less extended area. But the ebb follows the flood and the water recedes under the ice in so far as it is not frozen on the surface. With the next flood more water will emerge, and in the course of time an ice wall is formed at the farthest border of the water flow before it retires. With the rising of this wall rises the level of the water which is contained in this walled space until the ebb tide takes it back again, and as the fresh water is warmer than the ice cover, it will melt some ice at every flood which also flows back at ebb tide.

This explains the peculiar phenomenon that in all craters and ring-mountains the bottom lies deeper than the surrounding landscape. In Figure 12, Illustrations 1–4, the process of building such a crater has been illustrated, but for the sake of clearness the height of the wall has been greatly exaggerated. In reality the proportions of the height of the wall to the diameter of the crater will be at most that of the rim of a flat dinner plate to the diameter of its surface.

The impression made by these moon formations differs with the phases of the moon. In the first and last quarter we see, especially in the proximity of the bright border, steeply rising mountain ranges with walls, incredibly crevassed, and holes, seemingly bottomless, surrounded by high ring walls. The sharp contrasts between light and shadow are caused by the absence of an atmosphere which alone can create softer transitions in the illumination; but we see only the fully illuminated ice plains, and immediately beside them the neighbouring areas in the deepest,

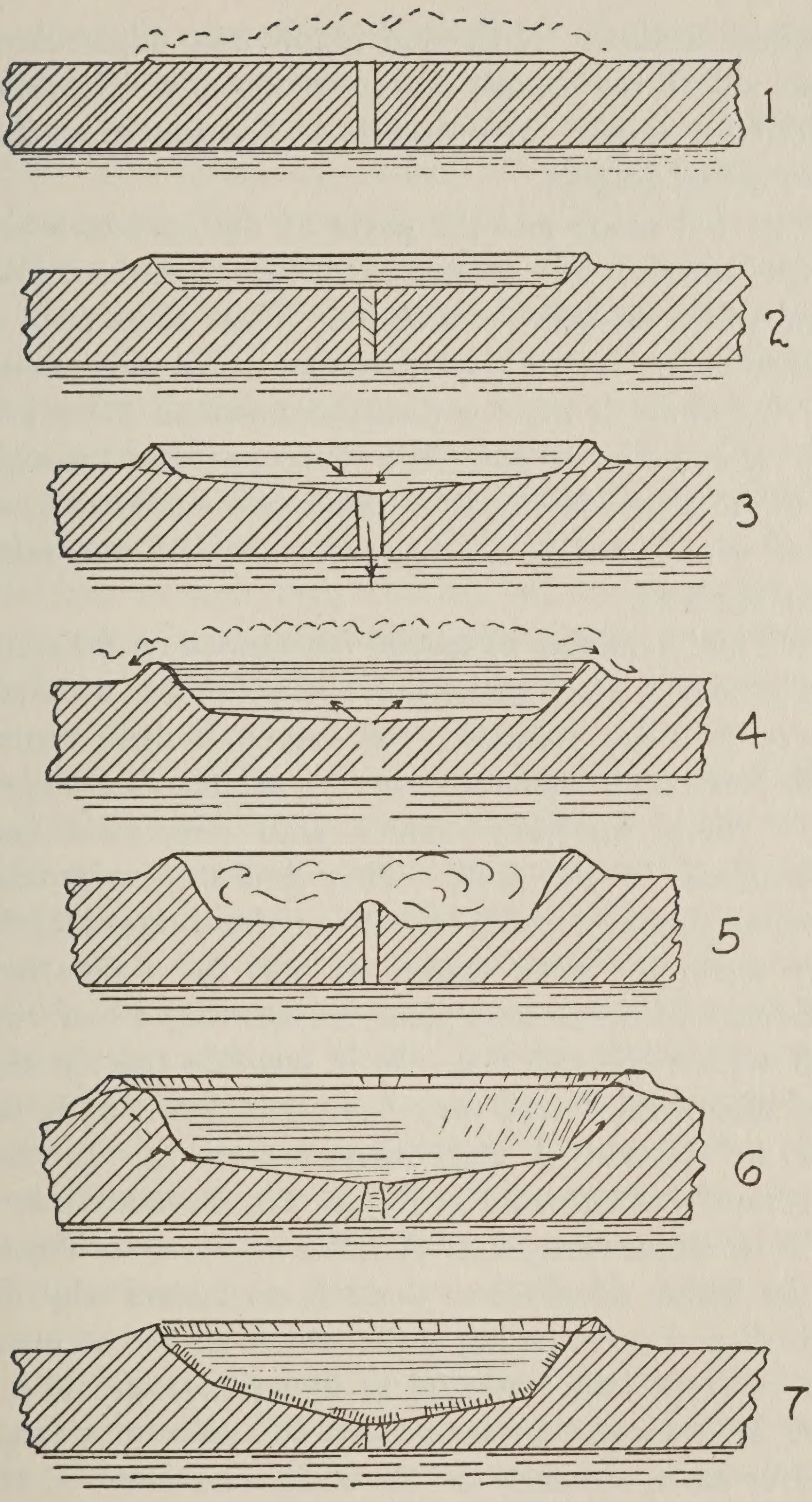

FIG. 12. THE STRUCTURE OF THE MOON CRATERS.

blackest shadow. If the sun is low even slight elevations will throw sharply defined shadows which can be traced for miles. This creates an illusion of greater than actual heights.

The full moon and the parts of the surface which have reached noon appear to us like a dinner plate upon which we look from above. There is no trace of a shadow or its surprising effects. For this reason the full moon is often a disappointment to those who view it for the first time in a telescope: But the sight of the first and last quarter fulfills all anticipations of those who hoped to see bottomless craters and other such wonders.

We find a number of special formations on the moon which find a more satisfactory explanation with our theory than was possible before; some of these formations have been illustrated by the sketches of Figure 12. There we have craters with concentric ring formations of the wall. They probably originated when an opening, which had already been closed, broke open again for some reason, so that for a time new outbreaks of water took place constructing a new ring wall within the old one. It is possible that in this way also a third wall may have been built, as is the case in Copernicus and others. Such a "terraced structure" is illustrated in Figure 12, Illustration 6.

These sudden eruptions of water may also be likened to the action of geysers; there is no reason why the shell-shaped surrounding walls which we see at many craters (especially beautiful at Manginus) should not have been formed by water and ice, only on a much greater scale, similarly as the chalk formation of the famous geysers of Yellowstone Park. We have only to substitute the effect of the flood on the moon for the effect of steam in the geysers.

But how can water create the central mountains which are found in almost all craters and ring-mountains? The answer to the riddle from our point of view is easy. If the opening had become narrow in the course of time or partly closed, so that only a small quantity of water could emerge at the time of flood, this small amount of water was necessarily freezing quickly next to the opening, and in this way one or more low elevations were formed, according to the number of openings. These appear to us in the telescope as high steep needles, but are in reality low and obtuse hills, sometimes even lower than the ice walls at the rim; this is illustrated in Illustration 5, Figure No. 12.

It might also have happened that a temporary closing of the opening prevented the return of the water, and in this case the water collected within the ring wall had to freeze. If with the forcible push of the next flood the obstacle was removed so that water could again flow out, the ice cover was broken, and the fragments remained on the bottom of the crater, as is seen in many instances. But if such fragment became wedged in the opening by the retreating water and the push of the new flood was not strong enough to remove it nor to form a new opening, then the water remained in the crater and gradually froze to the bottom.

An interesting case of this kind is Wargentin and its evolution as illustrated in Figure 12, Illustration 7. The freezing, of course, extends to the bottom, which, however, cannot be seen in the sketch, since we show only the ice cover as it corresponds to the former case. In Kilauea, the so-called fire lake of Hawaii, a crater filled to the brim with molten lava, we have a small terrestrial example similar to the Wargentin formation which has often been used as an explanation for these formations. But if we consider that the diameter of Kilauea is approximately seven hundred and fifty feet and Wargentin's diameter is sixty miles, we may hardly insist that molten lava is responsible for this formation in the case of the moon. For such lava could not spread over an area four hundred times greater than the one on Earth without solidifying. This fact speaks definitely against the volcanic theory.

We maintain that in the Wargentin formation the opening was closed by floating ice blocks, and the same may have happened in many other craters if the receding water had not found some way of retreat. For this reason a number of so-called central mountains would have been the result of an accumulation of ice blocks which had collected at the opening under the sweep of the receding flood waters. Many craters without central cones, but with level floor, as that of Plato, may also be formations of the Wargentin type. Only that in this case the last flood, which could not retreat, did not reach the height of the rim as in the case of Wargentin.

These examples should suffice to demonstrate the superiority of our explanation of the moon-formations and phenomena on the moon's surface which up to now presented great difficulties, but which follow logically our trend of thought. Of these phenomena we shall first of all consider the mysterious white rays.

One who has never seen the moon through a large telescope can hardly have a conception of these formations, but what is said here might perhaps induce the reader to study the moon through a telescope; he will then understand better these phenomena. Stripes of light, also called ray systems, are found over the entire lunar surface. We shall deal only with the most important, those of Tycho, Copernicus, Aristarchus, and the smaller Messier. The crater of Tycho is a very conspicuous object in the chaotic field of high mountains of the southern lunar hemisphere. In straight lines and regularly distanced, like the grooves of a peeled orange, bright streaks extend from the crater, continuing straight on over mountains and valleys.

Many a careless observer at the telescope has, at sight of these rills asked himself whether this might not be one of the moon's poles, confounding unthinkingly the moon with a terrestrial school globe. The aspect of these stripes resembles very much the degrees of longitude issuing from the terrestrial pole.

But while the rays of Tycho are very long and in some places eighteen miles wide, those of Copernicus, Aristarchus, and other ring-mountains bear a resemblance to the picture of a thick glass plate which has been struck by a hard object. At the point where the object struck, the glass is no longer transparent, but rather an opaque white and furrowed by a large number of fissures crossing one another erratically.

Altogether different are the two white rays emerging from the crater of Messier. Picture the following: Thick clouds of smoke issue from the low chimneys of two underground furnaces, in close proximity to one another. If there is but little air motion the smoke, like a thick rope, will move in the direction of the wind. The heavier particles, soot and ashes, will sink to the ground in two separate streaks. A heavy gas, confined in a crevassed mountain glen would flow off through breaks in the rim in a similar manner.

Let us now imagine an ice crater which has breaks or fissures in its surrounding walls which extend towards the bottom, and assume that water from the interior of the moon can fill the crater temporarily to a certain degree. There being no atmospheric pressure the water vaporizes; the vapor turns to ice-dust which cannot rise, being held by the attraction of the moon, and remains locked in the crater. New floods raise the layer of ice-dust, and when it has reached the fissures in the crater wall, it flows off through these and settles in streaks on the surface ground.

These streaks will be long or short, depending on the frequency of the process and the quantity of ice-dust generated, and here, at the crater of Messier, such a process especially favorable for our observation has occurred. In spite of the small size of the crater, two fairly long and almost parallel streaks of ice-dust have emerged from the interior, and have flowed over the plain of Mare Foecundatis. These streaks are without doubt caused by some dust-like material. But only a few rills of Tycho show this appearance.

Special research is needed to ascertain whether the longer and wider streaks are not formations resembling the "canals" of Mars. These streaks seem to be dark new ice, covered with frost when emerging from the lunar night, making them appear lighter and in advance of the rest, and contrasting but slightly with the surrounding ice chaos. The process is the same as we explained on Page 114 where we dealt with the dark and bright mare bottoms thus affected by hoar-frost formation. The fact that the edges of the rays are frequently accompanied by a chain of small and large craters also speaks for a new formation. The origin of these craters is to be sought in the outbreaks of flood water, which would occur more easily in such places than in the thick ice bottoms.

Here we have for once an analogy to terrestrial phenomena, where also chains of volcanoes always form along old breaks of the earth's crust. In Europe such a chain extends from Vesuvius over the Liparian Islands to Etna; the entire western coast of America and the eastern coast of Asia to the South Sea Islands is thickly strewn with volcanoes. Something similar can be observed on the moon, with the difference that here water instead of volcanic activity was the cause.

The telescope reveals that the so-called rills, of which there are thousands in all sizes on the moon, are merely breaks and fissures of the surface. The various hypotheses are in agreement on this phenomenon so that no further discussion is needed. Whether they are rifts in the ice crust or in a hardened earthy crust, the effect is the same.

We have so far studied the most important individual features of the moon. Let us now take a look at the surface in general, in order to determine the period when the last formations took place.

The southern lunar hemisphere is a wildly torn area covered with a chaotic distribution of ice blocks of gigantic proportions, but the northern hemisphere bears a calmer aspect.

It consists of a number of partly connected plains of large circular form, surrounded by mountain ranges of varying heights. Here we find the chains of the Appenines, the Caucasus, the Alps, and others, all consisting of towering primeval ice blocks, while the enclosed plains (mare) are new ice, which was formed by the enormous overfloodings of the crust after the capture by the Earth.

At that time the moon was already covered with a domed ice crust and was still slowly rotating around its axis. Such floods took place, of course, also before the capture, but the traces of the ice relief formations from that time were obliterated by the far more gigantic floods at and after the time of capture. At that critical time the enormous floes were piled up into mountains which need fear no comparison with our highest peaks.

All these changes from the original Mars-like appearance of Luna date from the time immediately following the capture, when everything on the icy surface of the new satellite was topsy-turvy. Only after the ice form had quieted down could the crust become thicker and stronger in the cold lunar night, so that the water could spurt only from occasional openings and the building of the craters began with the regular breathing of the flood and ebb tides. From such periodical flooding came the "mare" as we see them today with their half-buried crater ruins, as those of Gassendi, Archimedes, and others.

As long as there was still water under the ice shell and this shell itself had not become too thick, new openings could also be formed by the fall of meteors. Such meteoric bodies are always darker than ice on account of their sidereal (heliotic) nature. They will become warm under the rays of the sun. Although at first as cold as cosmic space, they grow much warmer than the ice in which they are imbedded and melt it somewhat, perhaps even carrying a store of heat into the lunar night, sinking deeper and deeper.

Thus they penetrate the ice shell, allow the water to escape and create a new ring wall. But even this last possibility disappears with the increasing thickness of the ice mantle and the complete freezing of all water underneath the ice. Knowledge of such an occurrence can be obtained only through a depression from the impact of the meteor, which might be seen, even when the fall of the meteor itself escapes our notice. That would create a new formation which however has nothing to do with interior forces of the moon itself.

It is certain that the moon is not a sphere, but has assumed a pronounced egg shape because of the attraction of the Earth, but the extent of this deformation can be determined only by exact calculations, which has not been done so far. Present astronomical science also assumes this ovate shape, for otherwise the phenomenon of libration could not take place, i.e., the oscillating movement of the moon by which small parts of the opposite half of its face become visible. According to our theory this could also happen in case of a perfect sphere, provided that its center of gravity is not exactly in the center of the sphere. This is quite possible in an ice ocean of sufficient depth. The water needs only to mount in the direction of the earth's attraction, so that the ice shell can finally grow together with the moon kernel on the side opposite the earth, because here a connection between the solid moon kernel and the ice shell can be formed the more easily because of the shallowness of the remaining water.

This automatically causes a dislocation of the center of gravity and in consequence of the changing positions which the moon takes alternately with respect to the sun and the earth, the oscillating movement due to the attractional forces of both these bodies is visible on the lunar disc. Aside from the physical libration we also have an optical one which results from the relatively unequal speed of the moon in its orbit around the earth. If this orbit were circular no optical libration would take place, and what libration was left would be due to the alternating gravitational forces of sun and earth.

Thus the moon wanders on its journey as a dead and cold body; but although it has no life of its own in the icy cold of cosmic space, it is destined for great things. Its influence on the earth grows from millennium to millennium. At present governed by the earth, it will in the future impose its law upon the earth and for long periods subject it to enormous catastrophes. This shall form the subject of the next chapter.

PART IV

THE DEATH-MARCH OF THE MOONS

CHAPTER I

The Fate of the Tertiary Moon

There is nothing as peaceful as a summer night, when the full moon is shedding a silvery light on the earth. Moonlight is connected with romance in the human mind, with romance and beauty and poetry. But, alas, the actual significance of the full moon, shining so brightly, is far from peaceful and romantic —it is one of deadly menace, of gigantic catastrophe, of terror and death, perhaps of the end of all life on our planet.

We must now apply some of the knowledge we have gained in the previous chapters of this book and follow all paths of thought to their logical conclusion. The shrinking of the planetary orbits under the resistance of the ether brings about conditions in the solar system which are far-reaching in their consequences.

It is certain that there have been several small planets revolving between Mars and the earth which gradually approached the earth, were captured, existed for long periods of time as moons, revolving around our planet and came finally so near that they were broken up and embodied in the mass of the earth.

We shall go back in our imagination into gray antiquity, but to a time when human beings lived already on earth, of primitive culture perhaps, but quite capable of remembering and transmitting to posterity the records of a frightful catastrophe in the shape of legends and sagas, highly colored by their religious imagination.

The earth in the tertiary period, the one preceding our own geological epoch, looks different. The general outlines of our continents are there, but an observer from an airplane would see a totally different arrangement of the surface. The mountain ranges were not the same as our maps show today, but then, a great deal has happened on earth since then. The Flora and Fauna are also not quite the same, unfamiliar plants and trees greet the eye and still stranger animals and monsters infest the earth.

But in the sky at nighttime shines the moon. If you look at it closely you will remark that there is something strange about it too. Sure enough, the familiar face with the outline of the imaginary "man in the moon" is not there—it is a strange moon, the tertiary moon, the predecessor of our present moon. And our present moon is still far out in space, revolving in its own orbit around the sun, a proud independent planet, seen by tertiary men on earth as a very bright star, the brightest and most conspicuous object in the sky.

The tertiary moon looks about as large as our own moon does today and, like it, rises in the east and sets in the west, and shows successively the same phases to an earthly observer in 28 days.

And now we suddenly move the cosmic clock forward a few hundred thousand years.

The general aspect of the earth and sky has changed completely! What has happened? The law of the shrinkage of orbits has worked its inexorable, iron will and the moon has approached the earth. It is now not any more at the comparatively safe distance of

240,000 miles or 60 times the length of the radius of the earth ball, but only half that far away, a distance of only 30 times the earth radius.

The shorter circle brings with it, however, a faster revolution. Instead of using 28 days for one revolution, the moon encircles the earth once every 9½ days; the month is only 9½ days long and the motion of the moon through the sky is three times as fast, as we are in the habit of seeing it.

That moons approach their planets, and in doing so accelerate the speed of their revolution, is borne out by the observation of the moons of Mars. Mars has two moons, very tiny bodies, which circle at a very small distance from the planet. Deimos, the farther one, is less than seven Mars radii or about 14,000 miles distant and makes a complete revolution in 30 hours and 18 minutes, a little less than a Martian day. The inner moon, Phobos, is only 2.77 radii or 5,600 miles away and circles around its planet 3 times each day. Phobos would appear to an observer on Mars about 1/5 the size of our moon, but much paler; Deimos as a star, a luminous point, as bright as Venus at its brightest.

Deimos still rises for Martians in the east and sets in the west, but Phobos, like our tertiary moon during its last stage, shoots over the horizon in the west, crosses the heavens in a rush and shows within four hours all phases of a moon, new moon, half moon, full moon and sickle again.

Before the discovery of Phobos by Asaph Hall, astronomers would have declared this an impossibility, as according to the Laplace hypothesis no moon can circle around its planet faster than the planet's rotation around its axis. Phobos is very near the limit which is set according to Roche's law as the point when a body approaching the planet must break up.

The cosmic clock, of course, strikes hours different from our earthly hours and it may take tens of thousands of years before this limit is reached and the breaking up process begins.

We do not know the coefficient of the shrinking of the orbit of Phobos, or we could predict when the cataclysm will take place. It is possible that our grandchildren may witness this phenomenon, which has occurred on Earth several times in the past. Perhaps not witness, unless the telescopes have been improved considerably by that time. Phobos is hard to recognize with our present instruments, so that it is out of the question that its fragments should be seen from earth. But the effect of its descent on the Martian surface may be visible.

When we learned the process of capture of a moon in the last chapter, we merely examined the influence, which the earth, as the larger and stronger body, has on the moon. But we did not consider at that time that such an influence cannot be one-sided, and that the approaching moon must also influence the earth by its force of gravitation and cause great changes on the larger body.

That such an influence exists is proved by the phenomenon of the ocean tides, and I shall digress a little at this point and invite you to examine a little closer this curious phenomenon of the tides.

In almost equal rhythm the ocean waters rise and fall. The seas seem to breathe, drive their waves against the coasts and draw them back again. This can be easily observed, for this slow, liquid element of our planet plainly follows the power of cosmic forces.

It is mainly the power of the moon's attraction which causes the tides. The sun also has a certain, but feeble, influence and that of the moon is 2¼ times as great. It causes the waters to collect in those regions which lie vertically beneath it; at that point is always located the crest of the flood.

The intricate movements of the tides need not detain us here, it is sufficient to know that the mass of water must collect under the zenith of the moon. When the moon and the sun are in line, the combined force of the two bodies is exerted on the water and an especially high tide occurs, called spring tide, sometimes with disastrous consequences to the habitations of men along the coasts.

The position of the crest of the flood under the zenith of the moon is but approximate, for the sluggish water masses cannot follow the movement of the moon with the speed of the latter, so that the crest is dragged behind the moon zenith.

The moon being now within 30 earth radii, the gravitational pull of the satellite has increased accordingly and there is a great accumulation of water along its path. This path does not follow the earth's equator. If we draw a line on a globe, connecting all points over which the moon stands vertically, we have a wave line which projects 18–28 degrees north and south of the equator. Along this line will be the accumulation of water and proportionately the polar seas will become shallower. The tropical regions will have an increase of water, and the ocean here will rise and the land disappear. At this distance of the moon all lower tropical regions will be submerged.

This increases constantly, for the moon does not stop on its spiral way to the earth, but comes nearer and ever nearer. Many thousands of years will pass; the moon's revolution will shrink from nine days to four, and the distance from the earth will be only 17.7 earth radii. The arctics will lose more water, the tropics will gain proportionately so that in the latter mountains will be reduced to islands, for in the meantime the oceans, formerly separate, have combined to a girdle flood, racing around the earth.

A belt of water surrounds the equator, subject to the tides as today, only that both, ebb and flood, have increased enormously.

But the further approach of the two bodies carries still stranger phenomena in its wake.

In order to be able to judge the facts fully, it is necessary to answer the question as to the proportion of water to land on earth. If we think of the depths of the oceans, in places exceeding 27,000 feet, and if we think of the enormous quantities of water stored at the poles, in glaciers in the form of ice, we may be convinced that there are immense supplies. That is true. But in comparison to the size of the earth-ball the ratio is comparatively small. This will become clear at once if we reduce the proportions to familiar figures.

The diameter of the earth is approximately 8,000 miles. Let us reduce this to 40 feet and give the surface of the sphere a thickness of 1/10 inch, and we have, if the earth had a smooth surface, in this 1/10 inch the amount of all the water on earth; 1/10 inch against 40 feet! But 4/5 of the surface of the earth is at present covered with water. No great power of imagination is required to picture the disappearance of the ghastly depth of the sea. If we reduce the size of the ball still more, to that of a school room globe, the thickness of the varnish would then be greater than the depth of the evenly distributed ocean water.

Keeping these comparative values in mind, the following deductions will offer no difficulties.

Supposing that the moon has approached to a distance of eight earth radii. Its influence on the tides will have increased correspondingly. The flood rises higher, the polar seas get shallower and the tropical waters swell to mightier heights. At this time, when the month is only one day and six hours long, the swollen circle should resemble a thick wedding ring around the earth.

By a little calculation, however, we arrive at a different result. We must take into consideration that the moon by its gravitational force drags the flood crest after it. One day and a quarter are needed for a revolution around the earth. In relation to the earth the moon wanders so slowly that the rotation very nearly approaches that of the earth. It follows that it is able to collect immense volumes of water under its zenith. On account of the small amount of water on earth and the continually rising flood, the ring will begin to split into two separate flood mountains. (Figure No. 13.) One of these mountains is located under the zenith of the moon and the other on the opposite side of the earth, created there by the enormous centrifugal force.

Still nearer the moon approaches, the flood increases, and finally the moon circles around the earth at a rate of speed making the month equal to one day.

To avoid misunderstandings it should be remembered that a given point on the earth also needs a day to make the daily rotation. That means nothing else but that the rotation of the earth and the revolution of the moon have the same speed, and that the moon never sets at a point where it is fully visible. Only the pendulum movement north and south over the equator can be observed, but no movement toward the east or west. Seen through a window it moves up and down only. On the part of the earth, turned toward it, the waters have piled up to an immense mountain. The other, centrifugal flood crest is on the opposite side of the earth. Hoerbiger shows that the flood mountain under the moon must be over Africa and the opposite one in the basin of the Pacific Ocean.

The force of gravitation exerted on the side of the earth toward the moon is 780 times that of the present. On the opposite side it is 530 times as great. Therefore the first flood mountains must be higher and more pointed, like a conical cap, the latter flatter and shallower. The result is that the earth has a shape not unlike that of an egg, although the comparison is an exaggeration. Let us presume, however, that the earth has taken the shape of an egg.

Up to now we have considered the influence of the moon on the waters of the earth only. But we must remember that the approaching body also forces the solid earth and the ocean of air to undergo changes. And thus we gain an interesting insight into the gray antiquity of our own world.

Just as the water was sucked from the poles to the equator and just as this process became stronger the nearer the moon approached, so that a small high ring of water encircled the earth, so also must the solid crust give way under the pull of the onstorming satellite. The result will be a continuous flattening of the

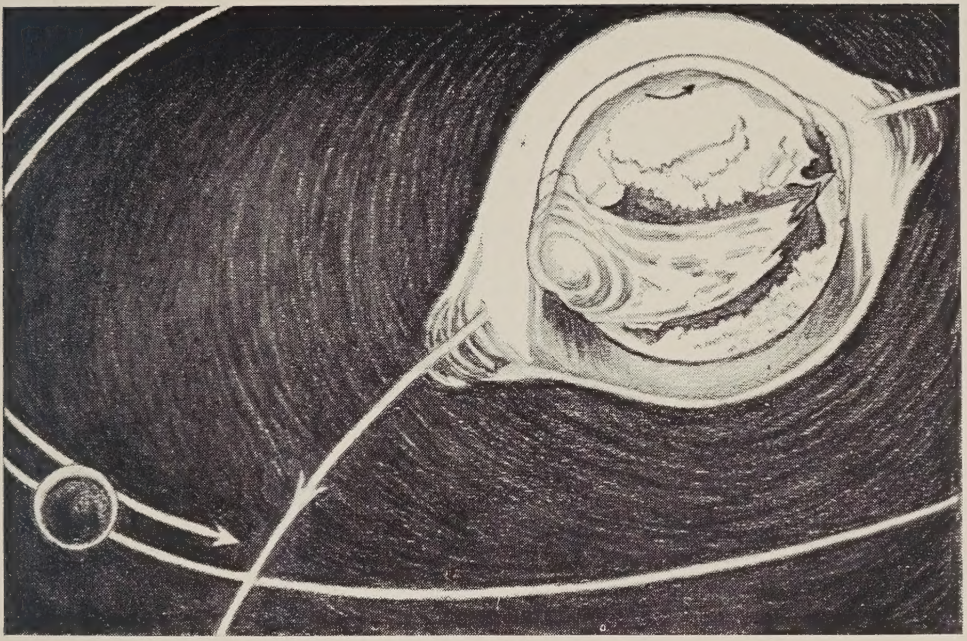

Fig. 13. The Earth with the Two Flood Mountains.

When the moon has approached to a distance of eight radii, the earth will have assumed a distorted shape, resembling that of an egg. There is a large mountain of water over Africa and a smaller one over the Pacific Ocean. These two Flood Mountains wander very slowly around the earth, as the moon's revolution is now accomplished in one day and six hours time, and the moon, seen by an earthly observer, seems to be almost stationary in the sky.

The poles of the earth are denuded of water and the ice has crept towards the equator and covers the greater part of the earth.

poles and a swelling in the equatorial region. Roughly speaking the form of the earth changes from that of a sphere to that of a lens. But when the girdle flood has parted into two sharply separated flood crests and these have been anchored on opposite sides at the time of the one-day month, the shape of the solid earth will change from that of a lens to that of an egg.

This process is a gradual one and spreads over a period of tens of thousands of years. Generations of men are born and die; tradition tells them that in olden times there was more land than now, that the sea is encroaching on the land and that the floods were not nearly so high and so destructive. Slowly the hunting and grazing grounds near the shores become submerged and it becomes imperative for the tribes living around the seashore to change their habitat. They begin to migrate to higher lands.

At first this was a slow wandering to the west to escape the slowly approaching flood mountains. Then this stopped when the flood mountains became stationary.

This period of the stationary flood mountains is of the greatest importance to us, for at this time great geological changes occurred which changed completely the face of the earth and made our present civilization possible. We go back once more to the age of the stationary tertiary moon, an enormous moon in the sky, neither rising nor setting, but oscillating north and south and dragging the flood mountains after it. Between the two flood mountains the planet was practically bare of water from pole to pole.

The pendulum movement of the stationary moon draws the water mountains north and south with irresistible power, and the force of inertia carries the waves still farther on their way, until the movement reverses and the flood turns to ebb.

It was during this time, lasting hundreds of thousands of years, that the great mountain ranges on earth were built, swept up by the enormous force of the waters. Large areas of land were affected by the pendulum movements of the flood mountains, daily the masses of water swept over them and receded again slowly. They carried with them great quantities of earth and minerals which were deposited in the regions north and south, where the ebbing process began. The thin crust of the earth was subjected to immense stresses. Every time the cosmic giant, the moon, turned from north to south, it tried to fold and tear the planetary crust, swimming on the liquid magma. This has been ably explained by Georg Hinzpeter in a book dealing with this subject, and requires too much technical knowledge to be easily understood by the general reader, but we shall touch shortly upon the explanation, as to how the coal and oil fields on earth originated, for their origin falls also into this time, the time of the stationary tertiary moon.

Thousands of miles of dense tropical forests were uprooted by the mad whirling waters, ground into fragments, mixed with earthy material and carried along by the floods. The waters became thick with this débris and the animal life of the sea fled into quiet bays and gulfs, where acceptable living conditions were still to be found. This thick broth was carried into higher and lower latitudes by the floods and there deposited when the movement reversed. A sifting process went on daily, the heavier substances sinking faster and forming strata below and the lighter vegetable material settling on top. This froze immediately in the enormous cold, of which I shall speak later, and the next daily load was deposited on top of it. Thus the process went on for long periods of time, heaping up mountainous deposits in layers, separating the material according to weight.

These mountains exerted immense pressure on the underlying strata and this pressure generated heat. Very slowly the ice in the lowest strata was melted and very slowly the water was pressed out. The various layers came into direct contact, but remained sharply separated under strict exclusion of the outer air.

This again requires tens of thousands of years, sufficient time to let the layers harden to stone. The vegetable material, which forms a separate layer for itself, would have decomposed and disappeared, were it not for the process of freezing. Without ice there would be no coal. It requires for its formation the exclusion of air, the pressure of the superimposed mountain mass and the resulting heat, to which we may add the heat from the interior of the earth.

This is the origin of coal according to the Glacial Cosmogony. There never were tropical forests near the poles; the poles never moved such distances from their present position, as to bring the tropics into the polar regions. The mountainous waves of this tertiary period carried all the material with them into the northern and southern latitudes and deposited it in a wreath around the poles.

A similar process accounts for the origin of the oil fields. Mineral oil originates from animal matter under high pressure and temperature. We must therefore account for gigantic deposits of animal bodies which by a chemical process were turned into the oil, as we find it today. The physicist Lyell claimed that embedded fish bodies in former river deltas were responsible for the oil reservoirs, but the supply of oil is too large to be accounted for in such a manner.

But how does the Glacial Cosmogony explain this difficulty? There must have been unusually large collections of fish in certain places, as the entire fish population of ponds and lakes is not sufficient for the formation of even a small oil deposit.

There is only one conclusion. The fish collected in immense quantities in certain asylums, when the ocean waters, agitated by the motion of the moon, became uninhabitable. Such an asylum would be for instance, the Mediterranean, where great masses of fish would be entrapped; the Gulf of Mexico is another one, also the Gulf of California, the Arabian Sea, and the Gulf of Bengal.

Here they were caught, and the pendulum waves swept them north and south and deposited great layers of them to freeze and become embedded, similar to the coal.

One of the most necessary substances for the existence of life is salt, and we find gigantic deposits of it in mineral form in various places on the planet. Their origin has been accounted for by an evaporation process of ocean water which, of course, leaves the salt. This would to a certain extent account for the salt deposits in regions, where it is hot enough to cause such evaporization. But what about the mighty deposits in Europe where they are found thousands of feet thick? We can again take the floods of the stationary period as the explanation of the process. At the very end of the flood wave, when the waters were already cleared of the material they had carried with them, they swept quietly along by inertia, perhaps into depressions, which they gradually filled.

A salt solution will, however, not only deposit its salt through evaporization but also through freezing of the liquid.

We have a number of regions, where such a freezing process at this time could have taken place and a book by Hanns Fischer, "Die Raetsel der Tiefe," will give all the details of the hypothesis to those who want to make a closer study of it.

We return to the happenings on our planet at the time of the close approach of the moon.

Not only the waters of the earth are under the gravitational influence of the approaching moon, but the envelope of air around our planet obeys the same master. And the influence of the moon on the atmosphere of the earth is of vital importance in respect to life.

The gas envelope will also flow away from the poles and gather in a swollen ring around the equator and then pile up its own air mountains over the flood mountains of the solid and liquid earth. With the beginning of this process, however, an irrevocable sentence has been pronounced over our planet.

What does the air mean to us? It makes breathing possible, and is therefore life itself. But that would be a narrow and too human an answer. We speak of an "envelope" with a purpose. We may also call it a wrapper or overcoat, for it protects us against the icy cold of space, which is 479 degrees below zero. If our envelope becomes thin, worn or broken, the icy cold of space has a way of entering and we have nothing but ice-cold winter. Ice and snow would cover the fields in the temperate zones and our regions of already gray days would become white deserts.

But what does the moon do? At the beginning of the girdle flood it draws the mantle back from the polar regions, slowly but surely, makes it thin and poor and opens the doors, at first slowly then more liberally, to the cold of cosmic space. The ice border, now high in the north and south, will begin its march to the tropics, step by step, but without halt. And from the white crests of the mountain giants the glaciers will push down, will, in the course of thousands of years, creep through the plains, and Europe, Northern Asia, North and South America, and Tasmania will be buried under gigantic glaciers before the girdle flood has separated into two crests.

WE ARE AT THE BEGINNING OF A GLACIAL PERIOD VISITING THE EARTH EQUALLY FROM THE NORTH AND THE SOUTH, AND WE HAVE WITHOUT EFFORT DRAWN THE VEIL FROM ONE OF THE MOST TERRIBLE RIDDLES IN THE HISTORY OF THE EARTH.

CHAPTER II

GLACIAL PERIODS

THE problem of the Glacial Periods is still one of the most controversial in modern geology. It is generally conceded that in the course of its evolution the earth suffered several times from a glacial period, but there is no explanation of such a phenomenon, which is generally accepted. The opinions differ as to whether sometimes the northern and sometimes the southern hemisphere or both at the same time were under the dominion of the creeping ice. English and American scientists generally favor the latter theory. At the same time a return to the "Catastrophic Theory," in some form is noticeable in the more recent teachings of geology and it were desirable that the research work in astro-physics and in geology would cooperate, and that meteorology also added its share. Instead the three branches of science are proceeding separately from one another.

An immense number of theories have been advanced in respect to a glacial period. Now cosmic and then terrestrial forces, sometimes even both combined, were propounded as the cause of the enigma. A very ingenious theory, the so-called Pendulum Theory, was advanced by Reibisch and Simroth. The main feature of this theory is the supposition that the earth received a tangential impact from some passing star, which imparted to it an oscillating motion around a certain axis. In consequence of this movement certain parts of the earth's surface will at times approach the equator and at times the poles, thus accounting for the change in climate.

Arrhenius considers the carbonic acid in the air a preserver of heat. A slight lessening of the activity of the volcanoes, which emit carbonic acid continuously, would result in great changes of climate, thus causing a Glacial Period. This still forms the basis of much controversy.

Still another theory is that the earth in its journey through space passed through colder regions. But the existence of variations of temperature in space is, to say the least, very questionable. What force could move the earth or the whole solar system out of its path without causing the greatest confusion and what caused its cessation and permitted everything to become normal again? The sun itself is also said to have caused the ice visitation by being covered with sun spots and not sending sufficient heat to the earth. But in all these theories one question recurs again and again: Why the periodical and rhythmic return of these periods?

There are still a number of other theories extant, none of them of a convincing nature, and we shall leave them all and learn what the Glacial Cosmogony has to offer us. We shall see that, if we treat the problem purely from a mechanical point of view, we find that the glacial periods are caused by cosmic events. Cosmic forces cause severe meteorological disturbances of the atmosphere, leading to a lowering of temperature and to great convulsions of the earth crust. All collateral branches of science meet here on common ground and we shall see that in this theory palaeontology and anthropology can find the solution of many serious problems.

Scientists of the old school admit that so far they have been unable to solve the mystery of the Glacial Periods by mathematical means, despite all attempts. But we have arrived at a conclusion which will help us to illuminate all the dark recesses of this strange region. To that end we must take a look at the state of affairs before and after the settlement of the flood mountains over Africa and the Pacific Ocean.

We see clearly the two flood mountains, the one at the pointed and the other at the obtuse end of the earth; between them, from one pole across the equator to the other pole, and from there back again across the equator to the first pole, stretches a waterless region, fixed by the two flood mountains, which we shall call the egg girdle, which stands vertical to the equator. The same conditions hold good, in a greater measure, for the air mountains which create between them a region covered with only a thin air envelope, admitting the cosmic cold. The slowly creeping glaciers and ice fields now penetrate into the limits of the egg girdle. The border of the glaciers has almost progressed to the tropical zone.

When a glacial period descended upon the waterless regions at the time of the stationary flood crests, it will naturally also have existed, geologically, shortly before and after this time. But before and after the stationary period the flood crests wandered around the earth, unnoticeably slower or faster than the earth rotation. It follows that all regions of our planet, with the exception of the narrowest tropical belt, must have been successively under ice.

Every time a satellite of the earth approached near enough to cause an accumulation of the waters around the equator, the same process happened to the air envelope, only in a greater degree, on account of the greater mobility of the atmosphere. We must therefore think of the air envelope around the earth as having the shape of an egg with the pointed end towards the moon. Like the water it will show two mountainous accumulations and between them a perceptible thinning of the atmosphere, a region of low atmospheric pressure. Low pressure always entails a sinking of the temperature and thus we have cold regions in the space between the two flood mountains. We observe the same phenomenon on high mountains, which causes mountain tops, even in the torrid zone at the equator, to be covered with eternal ice, which cannot melt because the thin air does not allow the light rays to change into heat rays, as they do in lower regions.

The deeper the girdle flood is around the equator, the more water is drawn away from the polar seas and the same holds good for the air. Cosmic cold entering through the thin air envelope begins to cool the earth and with the gradual approach of the moon the ice creeps farther and farther down. The moving flood mountains condition the forward march of the ice and at the time of the stationary flood mountains, when the month lasts only one day, two large crescent-shaped ice masses advance from each pole farther and farther towards the equator. When the flood mountains begin to move again in the opposite direction the ice in the lower latitudes is washed away and circular ice caps crown the earth. Parts of the earth were thus for thousands of years under ice, and again for long periods free from it, according to the position of the flood mountains.

If your mind has grasped the picture of the solar system, with the constantly narrowing orbits of the planets and the planetary moons, you will have no difficulty in seeing the necessity of geological epochs on earth being caused by the approach of successive moons, and before each moon cataclysm must be a period of high water in the lower latitudes and low water and ice visitation farther up. What happens on earth during and after the breaking up and falling of the moon, we shall learn in the next chapter.

CHAPTER III

The Death-March of the Moon

The period of the stationary flood mountains is the peak of geological occurrences and from now on the process reverses. Steadily the moon approaches, its revolution around the earth is now faster than the rotation of the earth around its axis, and for the inhabitants of the earth the moon now rises in the west and sets in the east. The flood mountains are slowly moving, following the irresistible pull of the giant in the sky. The cosmic clock begins to strike a new hour.

The centifugal flood mountain was torn from the basin of the Pacific Ocean, wandered over the Andes, and covered South America under its waters; the zenith mountain left Africa behind and moved eastward.

Life on earth followed the march of the waters. Man of this period would have experienced it hardly as a flight, so slowly did it take place. Vegetable and animal life may have wandered in this manner several times around the ball of the earth. There was nothing ominous in this, as the slow progress allowed them to become gradually accustomed to new conditions.

The moon in the sky must have been a wonderful spectacle, in diameter ten times, in area more than 100 times as large as our present moon. But this period also came to an end. The flood mountains accelerated their march, compelled by the ever faster circling moon, so that the water on account of its inertia could not keep step. It came to the point where the forward mountain reached the dragging waters of the one behind and again the two separate flood mountains combined into a mighty girdle flood around the equator.

This was the end of all land-life in the torrid zone, with the exception of a few points.

We have heard that the average depth of the oceans on earth is about 1.6 miles, if we suppose the earth to be a smooth ball. If the waters were drawn into a girdle, measuring about one-third of the surface of the ball, the girdle flood would then be 4,150 miles wide, with an average depth of 4.8 miles. But the moon will not cause such an equal distribution of the water, but will draw it along under its zenith in a long-stretched flood mountain between its two narrowed tropics. This has the shape of a slanting roof, of a height several times that of the present depth of the ocean, and it covers the highest peaks in the equatorial regions, whilst the borders are just above the water line.

The climatic conditions on earth have changed again. The outstretched "tongues" of glacial ice have retreated north and south and two ice zones lie around the earth, reaching from the north pole to about 30° latitude and from the south pole to about 25° latitude. The land zones between the ice and the racing girdle flood were still inhabitable and served as asylums for living beings during this period. Here they existed under rough, but not intolerable conditions.

The southern part of North America, the Andes and the southern part of South America, except for the tip, the high countries around the Mediterranean, South Africa, the highlands of Abyssinia, and the highest peaks of the Malay Archipelago still towered as lonely outposts of life above the great waste of waters which streamed past, ceaselessly toward the east.

Thousands of years passed thus. The moon had approached to a distance of two earth-radii. It now covered a great part of the horizon, grown to enormous proportions. Like a threatening world giant it stormed across the sky, four or five times a day, and terrible storms raged around the tropics. The earth, trying to form into a lens, groaned in its joints, broke into folds, tears and breaks, and shook in terrible convulsions.

Still nearer comes the moon, now more rapidly approaching and only 1.8 earth radii distant. The gravitational force of the earth now begins to tear the structure of the moon apart, the death agony of the satellite has begun, and the terrible tragedy proceeds to its final conclusion.

Tertiary humanity, almost bereft of its senses, witnessed the destruction of the moon. So deeply was the cataclysm impressed on the minds of the survivors that humanity never forgot it; those old documents of the human race, now called legends, tell of these incredible times, when the gods themselves battled in the sky and the cosmic monster, which threatened to devour the earth, was destroyed by fire and water.

We shall return to this in our next chapter; now we must witness the process of dissolution of the moon.

To better understand this phenomenon let us once

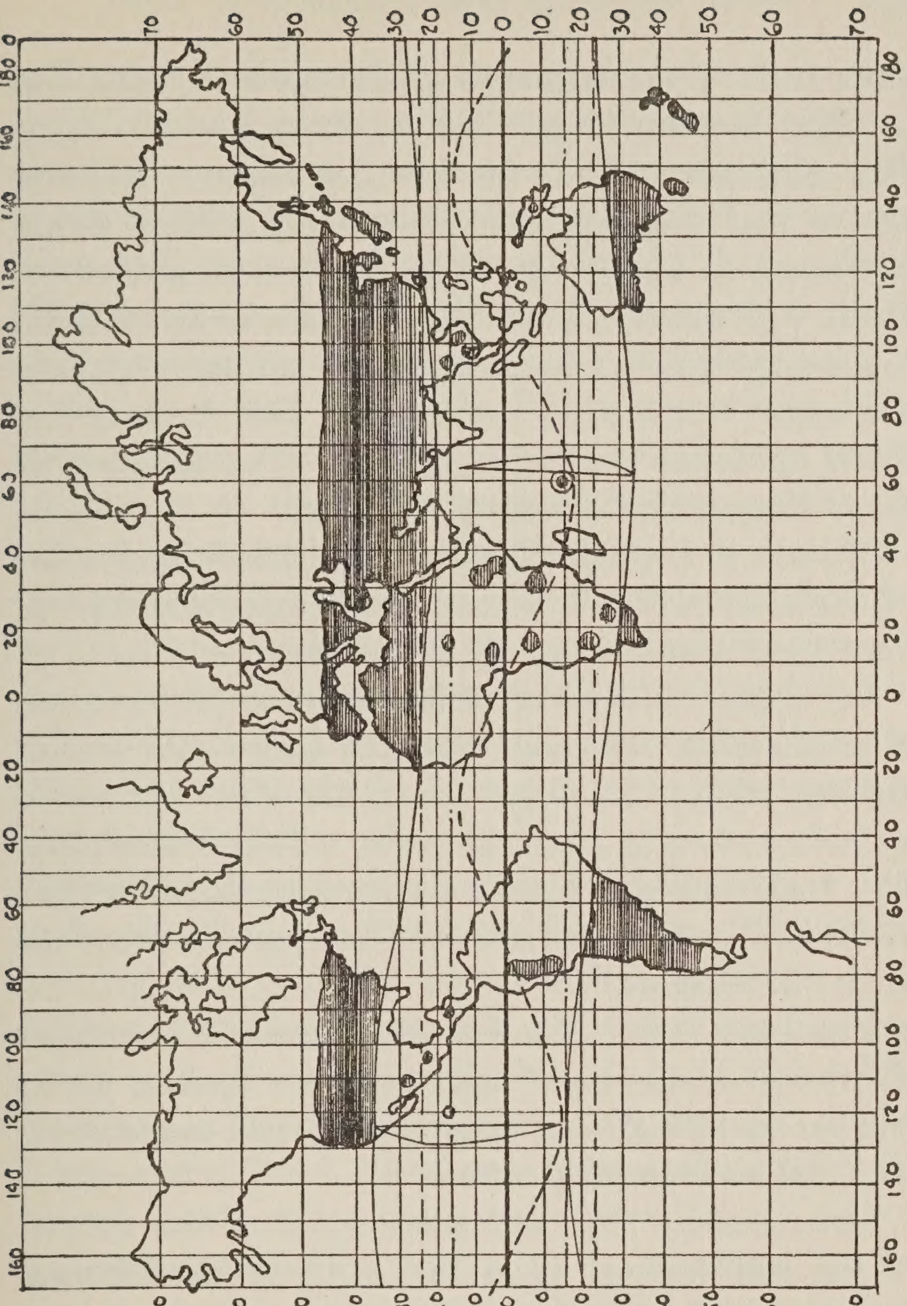
70 60 50 40 30 20 10 0 10 20 30 40 50 60 70
180 160 140 120 100 80 60 40 20 0 20 40 60 80 100 120 140 160

FIG. 14. ASYLUMS FOR LIFE DURING THE "GREAT WATER."

When the stationary flood mountains began to move again, the waters combined to a second girdle flood around the equator. The gravitational force of the approaching moon has drawn the air mantle down to the equator and two ice zones lie around the earth, from the north pole to about 30° and from the south pole to about 25° latitude. The land zones between the ice and the water and the higher elevations, which were not reached by the water, were asylums for living beings during this period of the moon cataclysm; they are the dark places on the above map.

more look at the structure of the moon. According to older theories its surface is covered with a lava-like obsidian. The Glacial Cosmogony however proves that our neighbour is covered with a shoreless ocean of ice, frozen to the bottom, to a depth of about 120 miles. Underneath is the solid material, consisting, like the earth crust, of earthy matter, in the upper strata poor in iron, but rich in iron and heavy metals in the deeper regions. The structure of the tertiary moon was about the same.

We are to keep this in mind, for the disintegration of the moon will take place in such a manner that we must have a knowledge of these things.

We must not think of this process as if the moon were plunging headlong upon the earth. A gradual disintegration of the upper ice strata, which are turned towards and away from the earth, will first take place. The fragments will form a double ring-shaped wreath of ice-bodies around the earth, like innumerable little moons or meteors.

The inner ones soon fall and penetrate the upper air strata of the earth and are here broken up by friction into small and large pieces, and cause incessant and terrible hailstorms.

Later the icy mud and salty water of the former oceans will descend upon the earth in cloud-bursts, then the earthy material of the ocean bottoms and finally the core, containing metals, will bombard the earth for days.

For the inhabitants of the earth who survived this cataclysm, the scene must have been one of stupendous grandeur and terror. An indescribable nightmare! The end of the world had come!

The moon, which we see as a small disc, peacefully appearing on the horizon and slowly making its way across the sky, had been changed into a monstrous apparition. Like a giant wheel, covering one third of the heavens, it shot up in the west, raced about four times daily around the earth, and caused three eclipses of the sun every day. Three times every night it sank into the shadow of the earth, and three eclipses of the moon were the result. A constant change from light to night, from night to light, visible only to the inhabitants of the higher tropical regions, whilst the rest of humanity lived in fright and terror, in a rapid change from light to dark. Without pause shot the ice fragments with enormous power and speed through the air, roared the storms, and rolled the thunder amid the wild lightning. Leaden grey clouds hid the sky, thickened, and descended in masses of hail and destructive cloud-bursts.

There was never a minute's rest from these phenomena. For days the ice fragments fell with a howling noise, like the approach of large shells.

Then came the rain of mud and red mire, poisoning rivers and wells, covering the land far and wide. The familiar earth had disappeared and the end of all things was at hand. And now flaming stars fell from heaven, with earsplitting noise, roaring, whistling, screeching, exploding and breaking the crust of the earth by the impact of their glowing masses. Volcanoes opened up where large, mountainous fragments penetrated the earth crust, poisoning the air with their noxious gases. The earth shook constantly in its very foundations.

Then suddenly a cessation! The noise stopped, the bombardment ceased, the sky cleared! From holes and caves crept tremblingly the pitiful rest of humanity and looked up into the sky. What had happened? Was it all over and had we escaped?

The gods had been victorious, for the giant of the sky, the moon, had disappeared. There was no monster there, threatening the earth with destruction. Calmly the familiar stars looked down upon the devastated earth.

Pæans of thanksgiving went up to heaven. But the great cataclysm was not ended yet. Another terrible catastrophe followed, suddenly, without warning.

Let us return to the cosmic picture, as it presents itself during the destruction of the tertiary moon. At the time of the cataclysm a mighty girdle flood, consisting of almost all the water on earth, raced with incredible speed and fury around the equator.

With the destruction of the moon, however, the giant power, which had held it there and propelled it, was gone and the waters, suddenly released, returned into their old beds, north and south, in a flood of indescribable magnitude. Mountain high, swirling, rushing, roaring, they suddenly appeared, destroying and overwhelming everything in their path. And death again reaps a rich harvest. Man and beast perished in the elemental rush of the unchained oceans and few, indeed, survived to tell the tale and transmit it in their own version to posterity.

This is the origin of the Great Flood legends of which almost every people on earth has its own legend and tradition, based on the actual experience of the eye witnesses and survivors, long ages ago.

Now the higher latitudes received water again, the coast apparently sank into the ocean, the dry land receded and the tropical countries experienced a great ebb and emerged from the waters.

A new earth had come, a new dawn had broken and for many generations a moonless sky smiled upon the earth, rejoicing in a perpetual spring time.

But the memory of the great catastrophe became a common possession of the races of man on earth. It was embellished and entwined with religious ideas, but on the whole the entire course of the cataclysm can still be traced in the old, old legends.

CHAPTER IV

The Memory of the World

It seems almost miraculous that life on our planet could survive such a cataclysm as I described in the last chapter. But it not only survived it, but transmitted accounts of it through the ages. This also seems miraculous, when we consider that we deal with primitive humanity, men of the Glacial Period, contemporaries of the mammoth, the great cave bear and the sabre-toothed tiger.

Let us now examine some of these ancient records, and begin with one which is familiar to all of us, because it forms part of the Bible; let us examine the revelation of St. John in the light of the Glacial Cosmogony. But do not get the idea that I am trying to use obscure passages of the Bible in an attempt to manufacture proofs and props for our hypothesis.

But if, as we shall see shortly, the ancient Greek myths and tales of poor, uncivilized Bolivians and Peruvian Indians, related by Humboldt and other explorers, are used by exact science as proof for the antiquity of man, we need not have scruples to use passages from the Bible for similar purposes.

The Apostle John was evidently not the simple Galilean fisherman, as tradition tells us, but must have been rather a highly educated man, who utilized records which have either been lost or remain unknown today. Perhaps they were the same records—

of a different tradition—from which the writers of Genesis drew their material. The author of Genesis was writing a history of Israel and, from events in the past, described the wrath of God and His punishment; John wrote in times after Christ. He appeared as preacher of repentance and described for sinful man the coming terror of the last judgment and the end of the world as a prophecy. He may have been the first who dared to write such a descrpition, a description based presumably on stone and papyrus records, the first to have found and studied and dressed them according to the spirit of the times, in garments of prophecy. In this form they were better suited to his purpose than if he had simply warned: "Such has been the fate of man in the past." Human beings are as a rule indifferent to terrors of the past; but such as are in the future, or may happen at any time, must be heeded. It is possible that the evangelist saw in those hoary words of wisdom a revelation for our ancestors, and if he makes no mention of the great flood it was due to the fact that he wrote for people who were familiar with these tales from their sacred scriptures. But everyone may seek his own explanation.

We read——

> Revelation 6: 12–16. "And there was a great earthquake; and the sun became black as sackcloth of hair, and the whole moon became as blood; and the stars of the heaven fell into the earth, as a fig tree casteth her unripe figs when she is shaken of a great wind. And the heaven was removed as a scroll when it is rolled up; and every mountain and island were moved out of their places. And the kings of the earth, and the princes, and the chief captains, and the rich, and the strong, and every bondman and freeman hid themselves in the caves

and in the rocks of the mountains and they say to the mountains and to the rocks 'fall on us, and hide us.' "

Revelation 16: 21. "And great hail, every stone about the weight of a talent, cometh down out of heaven upon men; and man blasphemed God because of the plague of the hail; for the plague thereof is exceeding great."

Revelation 11 : 19. "And there followed lightnings, and voices, and thunders, and an earthquake and great hail."

Revelation 18: 21. "And a strong angel took up a stone as if it were a great millstone and cast it into the sea, saying 'Thus with a mighty fall shall Babylon, the Great City, be cast down, and shall be found no more at all.' "

Revelation 8: 5–12. "And the angel taketh the censer; and he filled it with the fire of the altar, and cast it upon the earth; and there followed thunders and voices, and lightnings and an earthquake. And there followed hail and fire, mingled with blood, and they were cast upon the earth; and the third part of the earth was burnt up, and the third part of the trees was burnt up, and all green grass was burnt up. And as it were a *great mountain burning with fire* was cast into the sea; and the third part of the sea became blood; and there died the third part of the creatues which were in the sea, even they that had life; and the third part of the ships were destroyed. And there fell from heaven a *great star,* burning as a torch, and it fell upon the third part of the rivers, and upon the fountains of the waters; and the name of the star is called Wormwood; and the third part of the waters became wormwood; and many men died of the *waters,* because they were made *bitter.* And the *third part of the sun* was smitten, and the *third part of the moon,* and the third part of the stars; that the third part of them should be darkened, and the day should *not shine for the third part of it,* and the *nights* in like manner.

Revelation 16: 18–20. "And there were lightnings, and voices and thunders; and there was a great earthquake, such as was not since there were men upon the earth, so great an earthquake, so mighty. The great city was divided into three parts, and the cities of the nations fell; and every island fled away and the mountains were not found."

Revelation 9: 1–2. "And I saw a star from heaven fallen unto the earth; and there was given to him the key of the pit of the abyss. And he opened the pit of the abyss; and there went up a smoke out of the pit, as the smoke of a great furnace; and the sun and the air were darkened by reason of the smoke of the pit."

Revelation 9: 17–18. "And out of their mouths proceedeth fire and smoke and brimstone. By these three plagues was a third part of men killed, by the fire and the smoke and the brimstone, which proceedeth out of their mouths."

Revelation 10: 5–6. "And the angel that I saw standing upon the sea and upon the earth sware that there shall be *no more time*."

Revelation 21: 1. "And I saw a new heaven and a new earth; for the first heaven and the first earth are passed away; and the sea is no more."

(The Assyrian tradition tells also of a new earth which was covered with mud!)

If we try to translate these ideas and words into our language we can see that an eyewitness may be describing the disintegration of the moon. Earthquakes of unprecedented violence occurred when the earth reshaped itself from the geoid form and regained its spherical shape. This was a mechanical process bound to happen according to our theory. When we think of the shooting stars, shining in the reflected light of the sun, we naturally compare them to the stars falling from heaven, which were really fragments of the lunar ice shell. Among them were those which broke up into hail and also caused the described thunder and lightning phenomena.

The voices point to the howling caused by the cosmic projectiles shooting through the air, a noise well known to our soldiers from the shell fire of the war. That the sun became black and the moon red as blood and that both—as we read at another place

—were darkened three times in a day, exactly fits to the circumstance of the moon at the time of its destruction, revolving around the earth in from three to four hours. Also that it was either darkened by the earth shadow or caused an eclipse of the sun which, according to its size at that time, must have lasted twenty minutes. There must have been likewise three eclipses of the moon every night, since the earth-shadow must have met the moon at every revolution. These eclipses of sun and moon, together with a strong overclouding of the sky, allowed only a short time of daylight, so that the difference between night and day became uncertain and there was "no more time." Under conditions of great fright the attention is directed to the nearest object and circumstance, and when the usual contrast between light and darkness is wiped out all definition of time ceases. Only an angel, of course, could have pronounced such a fateful curse.

In another part of Revelation we read of a large sickle and a great scythe which appeared in the heavens, which may refer to the phases of the exceptionally large moon. The above-mentioned passage, Rev. 18:21, according to which an angel throws a millstone into the sea, destroying the great city of Babylon, John probably took from another source, believing he could use it for his own purpose without suspecting its entirely different origin. But we see by the following reasoning how correct the observation was and how faithfully it had been transmitted: If by a millstone is meant a disc of at least three feet diameter, it could represent the moon as it appeared to the observer in process of dissolution. Against this reasoning is the fact that no inhabitant of Asia Minor or Egypt could see this moon set in the west since it ran ahead of the earth rotation and had to rise therefore in the west and set in the east. But there was no sea to the east into which the angel could have thrown the object, metaphorically speaking. The entire description is obscure, of course, because neither classic antiquity nor the times preceding it knew of millstones of the size mentioned; the hand mills then in use were no larger than one to one and a half feet in diameter. But the new moon may have been of such size before its capture, namely when it approached the earth in a wide arc, until both bodies had regulated their orbits into paths little different from what they are today.

According to the power of imagination and expression of those times, only a divine being could have accomplished such enormous feats and therefore they let an angel throw a millstone into the sea to make the destruction of a great city seem to be an act of punishment. A later revisor, perhaps John himself, made Babylon the representative of such a pool of iniquity. We spent a little more time on this subject in order to show the apparent size of the moon and the direction of its revolution and to free it from the mythological irrelevancies.

Frequent mention is made of the great hail from which humanity suffered severely; but after a great hail of ice had changed to a hail of mud, stone, and slag, we read of the star "burning in its fall like a torch, which burned trees and the green grass." This probably refers to a fragment of the moon body which became incandescent during its flight through the air. The statement that the sea after the fall of such a body turned to blood may refer to the dissolution of red earth and slag matter of the moon in the sea water. Mineral constituents made the water bitter—a chain of single observations which have not been made difficult or improbable by the reference to cosmic disturbances. In case of the star which fell from heaven and received the key to the fountain of the abyss we must think of a large falling body which, striking perhaps an already broken surface, caused a new volcano to appear. From such fissures issue during severe earthquakes, fire, smoke, and brimstone, as the prophet phrases it, from which the people died, and these are phenomena observable in our day. How much stronger must they have been under the paroxysms of the catastrophe, when whole islands may have disappeared?

If we can explain in a natural and simple manner the story of stars falling from heaven, the millstone, which the angel throws into the sea, the great sickle and scythe and other things, according to the Glacial Cosmogony, we can in the same manner elucidate one of the most obscure passages of the Apocalypse. This passage is so interesting and has furnished so much food for thought to interpreters that we are justified in submitting Hoerbiger's solution. We read in Revelation 4:6: "And before the throne was a sea of glass like unto crystal; and in the midst of the throne, and round about the throne, four living creatures full of eyes before and behind." These mythological creatures, which often are mentioned in Revelation, are described as of fantastical shapes, and may have been pictures of prehistoric animals retained in the racial memory, but no longer found. We shall disregard them and examine what is meant by the "sea of glass."

Man of the Glacial Period (tertiary cataclysm) was intimately acquainted with ice, more intimately perhaps than he desired. It is not impossible that when he looked at the moon, at that time twenty to twenty-five times the size of the present one, it seemed to him that the surface resembled ice. A people which decorated their caves with artistic drawings (Altamira) had probably learned to observe closely. The moon which perished at that time was probably very much like our present one in general appearance, and its face would have made a similar impression on the observer. We reason as follows:

Tertiary man (until now quaternary-diluvial man) knew what an ice sea looks like and seeing the moon at close propinquity would recognize its ice formation. He saw it also as a sphere and must have supposed, in consequence of the librations, that the other half was covered with similar indentations as the always visible front. Later generations, contemporaries of the last moonless period (Proselenes), might have told of the frozen sea in the heavens, covered in front and back with eyes. A mix-up of traditions may have led to the combination of the moon and the animal pictures and made eyes out of the lunar craters. Then consider the possible mistakes of translators and interpreters. Ice in Greek ϰρυστάλλος. The same word was later used for crystal, and even glass, and one of the later translators, who as an inhabitant of a country around the Mediterranean could not imagine a "sea of ice," chose for his translation the word "glass." Hence the "sea of glass" as we have it in Revelation. We come to the conclusion that the observation as told in Revelation was correct and the moon was meant—the solution of a question which should incite Bible and language students to fuller research than was possible for an engineer, like Hoerbiger, for whom these matters are only of secondary importance.

The Edda, the ancient Scandinavian classic, is one of the oldest documents of the human race. It says, "I will tell the tales of the past from the earliest memories." And these events of which the Edda tells are not myths of nature, nor imagery, but reminiscences of the earth's and humanity's early dawn, of fateful happenings and frightful calamities.

The Tertiary Moon had approached the earth. The two flood mountains wandered slowly from west to east. The equatorial regions were under water and men had settled on the heights of southern France and northern Spain. From the south rim of the Cevennes, or Catalonian Mountains, they saw the tidal waves rushing from the south. Higher and higher rose the flood. Hours passed and the moon swung south and dragged the flood mountain with it. There appeared to the human sight a primordial phenomenon, a colossal abyss opened—"Ginnungagap" as the Edda calls it.

In the north were the glaciers, icy areas reaching down over northern France and northern Germany. Mighty streams of icy water flowed south, and the melting ice caused a constant fog over the land, where the sun was but rarely seen. Here was "Niflheim" the home of the mist. The Edda says: "In the north of Ginnungagap was Niflheim—fashioned many years before the creation of the earth. It was filled with heavy, weighty masses, with hoar frost and ice, which caused rains and winds." In the midst was the fountain called Hwergelmir from whence eleven rivers emerged.

But what a difference when one looked toward the south! Here through the mist appeared a mighty glow of fire, as if the entire south were in flames. A few degrees above the horizon there was the Tertiary Moon, now already near death, more than three thousand times as large as the present moon!

This giant moon seemed a sea of light and fire,—the Muspelheim of the Edda.

But on certain evenings they saw, instead of the disc of the full moon, a gigantic fiery sickle, reaching far into the sky, whose lower part lay below the horizon—Surtur's Sword. And the Edda says: "In the South of Ginnungagap was Muspelheim, hot and light and fiery, and nobody can enter it. Surtur rules there, sitting at the border of his realm; in his hand he holds a fiery sword and at the end of the world he will come to vanquish all gods and burn the world."

The Tertiary Moon had the same characteristic surface as ours and was completely covered with an armour of ice. The shadows of its ring mountains had the appearance of eyes, and the fantasy of the ice-age hunters saw something terrible—a grim, horrible face, a gigantic head which looked over the horizon. Its forehead reached far into the sky, limbs and body were below the earth. This was the frightful ice giant Ymir, "the howler."

There were frequent eclipses. Then the giant's face glowed in various colors, from the brightest red to the deepest violet. Pale lights flickered over his face and made the aspect still ghastlier.

Thus the cosmic giant appeared to that generation, moving swiftly over the horizon two to three times a day. Thunder and lightning and wild storms on land and sea accompanied his coming.

Then came the cataclysm, mainly over the tropical latitudes, but dreadful even here in these mountains. Storms howled about the settlements, day and night were black, the earth shook in its foundations, and the terrific noise of the débris of the falling moon, rushing through the atmosphere, must have been indescribable. Ymir's head was but rarely visible in the uproar of the elements.

The most terrible part of the cataclysm, the breaking up of the moon core, is not described in the chapter of world-creation, but in "The Dusk of the Gods." The actual cataclysm was of short duration. After a few weeks Ymir had dissolved over the tropics, and the girdle flood, free from his influence, began to recede north and south. The plains, the mountains, sank into the constantly rising flood, only the highest peaks remained above water, small asylums for the despairing human survivors. This catastrophe is told in the following words: "The sons of Bur killed Ymir, and so much blood flowed from his body that the entire brood of the ice giants was drowned therein; only one escaped with his kin. The giants call him Bergelmir. He entered a boat and saved himself and from him are descended the later generations of ice giants, as is told in the song: 'The earliest knowledge I have is that the experienced giant was born in a boat.' "

Similar descriptions are found in the literature of ancient Egypt, of Persia, of Finland, and of other countries in both hemispheres. Such a world monster could have been destroyed only by the might of the gods. In the Edda the cataclysm was the fight between Wotan, Wili, We, and Ymir, and Ymir's body was taken to Ginnungagap and the abyss filled with it.

Georg Hinzpeter in his work, "Urwissen von Kosmos und Erde," traces the Babylonian legends which are somewhat different, because the tribes, who survived the glacial period much farther south, had naturally another view of the cataclysm. They lived either on the edge of the girdle flood or surrounded by it on high plateaus in the tropics. Seen from here the impression of the dying satellite was, of course, a different one than in the north, where it rose only slightly over the horizon. But in the tropics it raced across the span of the sky. Consider its various aspects, especially in the first and last quarter when it appears as a crescent. Like two gigantic tongs the horns of the crescent reached across the heavens. A fascinating, and at the same time, awe-inspiring sight, for the moon appeared to the frightened people sixty to eighty times as large in diameter as the present one.

This all happened whilst wild storms were raging on earth. The dying moon drove the atmosphere in hurricanes around the earth ball. Only occasionally, suddenly bursting through the whirling clouds, appeared the gigantic tongs, many hundred times as bright as the present moon's disc, and threw a pale and at the same time intense light over the black shadows of the earth.

And man believed he saw the wide-open mouth of a titanic dragon, sweeping with ghostly speed across the sky, changing its shape with lightning rapidity, as it suddenly appeared on the western horizon and sank in the east.

The countless ice craters seemed like so many eyes, with deep-black shadows and fiery reflexes. And this happened not once in every night, but two or three times!

The frightful apparition bordered on the unimaginable, when the cataclysm began, and the first ice blocks broke from the firm structure of the moon and trailed in a constantly growing swarm, like a colossal streak of light behind it, glowing, shining and sparkling.

If the crescent was open toward the east, in the line of movement, an endless tail followed the head of the cosmic dragon, spanning the entire sky, luminous in the sunlight like molten gold, the tail of the cosmic monster. No comet's tail, be it ever so impressive, can possibly give an idea of this terrible sight.

But consider the opposite case, when the giant crescent yawned toward the west. From the mouth of the monster shot then a white shining burst of fire which, at the setting of the moon, flamed across the heavens and disappeared in the west: The fire-breathing dragon!

These phenomena became more pronounced with every revolution of the moon and a strange change came over the monster, when the disintegration was in full force. The cosmic uproar allowed only a glimpse, for a few seconds, of the dying monster, but every time it looked different. Its edges more and more torn, the shape broken, but the tail growing into the immeasurable. When the cataclysm was over and the world became light again, there was nothing more to be seen of the monster, but over the earth roared the wild waters of the cataclysmic flood, returning into their old beds, north and south.

Reminiscences of the cataclysm are found in the Old Testament, in the story of the creation, as the book of Genesis tells it:

"And God said, let there be light, and there was light." Many have pondered over these words. The light of the sun could not have been meant, for the sun was not created until the fourth day. But what light could it have been, if not sunlight? Clearly an impossibility! But yet Genesis tells nothing impossible. For after the core of the moon had descended, the second ring of hail was precipitated and the darkness disappeared, but only a dim light shone through the dense cover of the clouds. The survivors of the cataclysm could not know that this light came from the sun, and thus they say quite naturally for the first day of creation "Let there be light, and there was light." It was probably weeks later, before the sun itself could be seen.

And again we read: "And God said, Let there be a firmament in the midst of the waters and let it divide the waters from the waters. And God made the firmament, and divided the waters, which were under the firmament, from the waters which were above the firmament; and it was so. And God called the firmament heaven."

A wealth of material has been collected in Hinzpeter's book which I mentioned above.

"Let there be a firmament (rakia) *in the midst* of the waters!" This is hard to understand. This firmament divided the waters above and below and the rigid firmament was to be the dividing line. The usual explanation is that the seas and clouds are meant by the waters below and above.

Let us look at the citation in the light of the Glacial Cosmogony! At the beginning of the cataclysm the ice mantle of the moon disintegrated, and for days and weeks immeasurable masses of water and hail descended on the earth. The natural thought was: this is no rain or hail, this is an ocean falling from heaven!

And when the moon-fragments fell, the frightened men thought that the heavens themselves were breaking down. The destruction of the firmament was the cause of the heavenly seas coming down upon the earth. A very natural explanation. The heavenly and earthly seas were united in one great water!

If a "new world" had to be created, it was, of course, necessary to divide the two waters again and that could be done only by the erection of a new "firmament."

The Edda mentions nothing about the division of the waters. But the people who wrote the Edda lived not in the tropical regions or a short distance above them, but rather far away in the higher latitudes. They were not so much impressed by the descent of hail and rain as their southern neighbours. The idea of the "waters above" was a strange one to them.

These interpretations of old myths have to be taken of course with a large grain of salt. They are not essential to the Glacial Cosmogony and one may be sceptical to a certain degree about the correctness of these interpretations. The attempt to interpret the ecstasies of St. John intelligibly may meet with serious objections. Many attempts have been made to interpret these fantasies in a scientific sense, but not very successfully, and whilst they seem to fit perfectly into the description of cataclysms, such as were caused by the dissolution of a moon, it will still remain doubtful to many whether this interpretation is the right one. But it certainly seems a remarkable coincidence.

CHAPTER V

THE GREAT WATER

DURING the cataclysm of the tertiary moon the waters were racing around the equator in a mighty girdle flood. Mankind called this flood the "Great Water." Many tales, and especially those which tell of the "Great Water" before the flood, have come to us from primitive peoples, without the art of writing and have been brought from America by explorers like Humboldt, Falb and others; they were transmitted by oral tradition from generation to generation.

Such a ray of light comes to us from gray antiquity, this time from the plateaus of Peru. The Peruvian Indians have an age-old tradition, related by Humboldt, which received a new interpretation by the research work of later scholars. Among them is Falb, who first cites Humboldt, and then relates his own experience. Humboldt says in his American travel diary: "I cannot leave this part of the Encaramada mountains without mentioning a matter which we often encountered among the missions of the Orinoco. A tradition is preserved among the aborigines of this country that at the time of the *Great Water,* when their forebears had to take to their canoes to escape the general inundation, the waves of the sea reached the high rocks of Encaramada."

This legend is found not merely in one single tribe, the Tamanakes, but it belongs to a circle of historical tradition, which is current with the Maypuros near the great cataracts, with the Indians of the Rio Crevato, and with almost all the tribes of the upper Orinoco. A few miles from Encaramada there is a rock in the middle of the Savanna, the so-called "Tepumereme," the painted rock. On it one sees pictures of animals and symbolic characters similar to those which we saw on the return from the Orinoco, not far below Encaramada, near the town of Cayrara.

Between the Cassiquiere and the Orinoco, between Encaramada, Capuchino and Cayrara these hieroglyphic figures are found chiseled in the 100-feet high rocks, which can be reached today only with very high scaffolds. If you ask the aborigines how it was possible to chisel these pictures at such a height, they answer with a smile, as if they related a simple fact of which only a white man was ignorant: "At the time of the great water our fathers rode in canoes at that altitude."

Quite near to these remarkable mementos, left by the hand of man, the rock shows a number of watermarkings and strand-lines which the sea chiseled there during a period lasting thousands of years. It proves that at that time the flood had reached a height of 10,000 feet above the present level of the sea.

The migration of the tribes to such a height was not voluntary but a flight to save their lives, and the chiseled paintings were made during the course of a long occupation of these lands.

Falb says: "These old legends which we find all over the earth, strewn like the débris of a shipwreck, are of the greatest importance to historical research." Hoerbiger adds that it might be just as important for the study of the beginning of human history, to listen to the tales of old primitive peoples (before they are extirpated or "civilized") as to explore ice caves.

At this point we wish to draw attention to the difference between the Biblical and the Indian traditions. In the Biblical tradition we deal with the real "Great Flood" which happened at the receding of the girdle flood after the dissolution of the moon, and therefore could not have been of great antiquity; in the Indian tradition, on the other hand, we learn of the customs of a people who were driven into the mountains by the constantly rising waters of a stationary flood and who in thousands of years of their habitation at that height had become sedentary, a fact indicated by their pictorial relics on the rock walls. During a temporary inundation, no matter how large and general, they would not likely have chiseled pictures on the rocks from their canoes!

Falb then continues: "Another peculiar feature of ancient Peru are the many hills crowned with terraced structures. Most of these I saw in the valley of the Ubinas where both mountain slopes up to their summits are covered with them. They very much resemble in their construction our vineyards, and were evidently used for cultural purposes which are obsolete today. They are deserted and neglected and appear in such numbers that they seem out of proportion to the needs of the present population. They are also witnesses of the climatic change which has taken place here.

Different from the terraced structures are the peculiar stone seats, regularly carved from the living rock. They appear, not in the shape of terraces but are distributed over the surface of the rock. One of them, the most difficult of access, bears a chiselled cross on its seat. In the neighbourhood of these stone seats there is usually a water level."

Near the Titicaca lake, high up in the mountains, there are extensive subterranean caves and temple structures. Falb writes of them: "The Indians of Peru relate that the first Incas (certainly a blond tribe, like the Titans of the Greeks) had issued from the caves of the Titicaca lake, where they had found shelter during the time of the great water, and had carried their civilization down again into the lower country."

Before leaving the subject we shall listen to Hoerbiger in respect to the distribution of water in these elevated stretches of Central America, as well as partly beyond the tropics, during the time of the post-stationary girdle flood of the tertiary cataclysm. The higher geographical latitudes were, as we know, bare of water, and with the middle ones, up to the tropics, completely under ice. Habitable land existed only in those parts of the equatorial regions which were too high to be reached by the waters of the new girdle flood, for instance Colombia, Venezuela, Equador, Peru, and Bolivia. Over Panama and Southern Mexico the girdle flood rolled in a broad stream from west to east, on account of the approach of the tropics of the moon to each other. But as the waters of this advance girdle flood rose, the agricultural belts had to move to the present heights in these tropical asylums of the glacial period. Here only terraced fields could yield enough for a meagre living. But even these must at times have been under water, at least the lower ones.

The fall of mire and loess during the dissolution of the moon and the ebb of the waters turned them into complete swamps, but they were again uncovered by atmospheric influences, a state in which we find them today. In these elevated asylums the crowded remnants of humanity lived for long periods of time. Here also they survived the times of the great flood.

CHAPTER VI

THE GREAT FLOOD IN LEGEND AND TRADITION

WITH the breaking up of the moon and its final destruction, its force of gravitation ceased and the waters around the equator were released and retreated in a great flood. This experience of a great general flood has been well preserved in many traditions and legends of the human race.

In more than sixty traditions, mostly independent of one another, found in various parts of the earth, we hear of a great flood and destruction by water which cannot be considered as myth. They concern an experience through which thinking men have lived!

John Riem, referring to Andree's list of Flood-Legends, mentions three legends of Asia Minor, viz., the Gilgamesch Epic of Babylonia and two versions in Genesis. For the rest of Asia he numbers ten reports; among them the ancient traditions of India and Persia. In Europe we find four, the Hellenic story of Deukalion, the Edda, and two later ones. Africa furnishes five, one of antiquity, of Egyptian origin, and four of the present age. North America is especially rich in flood-traditions. No less than nineteen different stories are found here, from those of the Eskimos to those of the Indian tribes of the Union. Then comes Central America with four and South America with fourteen reports. Australia and the South Sea Islands complete the list with nine traditions. Altogether sixty-eight reports.

Riem has sorted these reports according to origin of the flood, duration of the flood, means of rescue of the survivors, and termination of the flood. He finds that rain, as cause of the flood, is given seventeen times, otherwise storms, tidal waves and inundations. Ten reports make the flood last from five days to fifty-two years (Azteks). The rescue is effected thirty-seven times by ships, and twenty-two times by flight into the mountains, to high islands, or into caves. In almost all cases the water recedes by ebbing away; only in five cases the wind evaporates the water and dries the earth. (Riem; "Die Sintflut." Stuttgart, 1906.)

Accounts were transmitted to us in the tablets of the Assyrians, in reports of the Chinese, East Indians, and Egyptians and the most familiar story is the one in the Bible. How long might not this tale have been told from generation to generation, before it was taken up by the priesthood, engraved on clay tablets and finally written down on papyrus?

When the Assyrians tell of a fortress behind which they thought to be secure against the flood, and others of a ship in which they were saved, one tale is as credible as the other. The difference lies in local conditions, and that must be considered if we wish to recognize these old myths as what they really are, namely very old records of the youth of the human race, which preserve for us the story of one of the most fearful times and experiences through which humanity ever passed. These traditions certainly underwent changes in later times, according to the purpose of the chroniclers in recording them or according to the reliance which they placed in the truth of their original sources.

A Babylonian who wants to relate the salvation of his people from a general catastrophe would speak of the employment of a ship as a means of rescue, under personal supervision of a god, because he was not familiar with the immensity and power of the sea, whilst those living near the shore would rather seek high mountains or the interior of the country for safety, instead of trusting themselves to the water of whose dangers they knew.

Men seeing the catastrophe in the tropics, e.g., in the Abyssinian mountains, saw more of the débris of the perishing moon hitting the earth than those who witnessed the event in a different form in the middle latitudes. In short, there are many variations and seeming contradictions in the variegated reports. All can be explained without undue strain to the intellect.

Who knows what is in store for the diligent explorer, for instance, in the countries of Mesopotamia, the site of age-old traditions? Until then we shall have to be content with what the Bible offers, aside from a few Babylonian fragments. But what we find here is a source of valuable information, when illumined and explained by the Glacial Cosmogony.

We read——

> Genesis 7, 10–12: "And it came to pass after the seven days, that the waters of the flood were upon the earth. On the same day were all the fountains of the great deep broken up and the windows of heaven were opened. And the rain was upon the earth forty days and forty nights."
>
> Gensis 7, 17–24: "And the flood was forty days upon the earth, and the waters prevailed exceedingly upon the earth and all the high mountains that were

> under the whole heaven were covered. Fifteen cubits upward did the waters prevail and the mountains were covered. And all flesh died that moved upon the earth, both birds and cattle and beasts and every creeping thing that creepeth upon the earth and every man."
>
> Genesis 8, 1–13: "And God made a wind to pass over the earth and the waters were assuaged: the fountains also of the deep and the windows of heaven were stopped and the rain from heaven was restrained; and the waters returned from off the earth continually and after the end of a hundred and fifty days the waters decreased. And the ark rested in the seventh month on the seventeenth day of the month upon the mountains of Ararat. And the waters decreased continually until the tenth month, in the tenth month on the first day of the month, were the tops of the mountains seen. And Noah knew that the waters were abated from off the earth—and, behold the face of the ground was dried."

If we are informed that God had warned Noah of the rise of the waters beforehand and had advised him to build the ark, then the story, translated into our language, reads as follows: The inhabitants of Mesopotamia heard from fugitives arriving from the south, that the waters were approaching. Says the Assyrian cuneiform record: "The waters came from the sea," i.e., from the direction of the Persian Gulf. Cautious individuals, who had the means, believed that they could avoid the danger, by providing themselves betimes with vessels on which they could escape if it came to the worst. This well calculated forethought sustains Hoerbiger's theory, which Dacqué calls the best which has ever been presented of the flood.

Had the Mosaic Flood been only a tidal wave, as is asserted by many exponents of the Assyrian text, which came into the land from the south, there would have been no time for the building of arks, it would have been a sudden, unexpected catastrophe. Neither can a flood swell through mere rains to such an extent as to cover the mountain heights. Thus we arrive at the following explanation: The last days of the moon had come. Revolving around the earth at a distance of 9,000 miles, it had contracted the sea to a narrow girdle flood, the crest of which raced majestically between the two tropics of the moon which had closely approached each other, and reached to certain districts to the north and south of them.

From the poles the ice had advanced into the lower latitudes. Between it and the girdle of water lay the part of the earth still inhabitable in the northern hemisphere, North Africa, Asia Minor with Mesopotamia, Persia, etc. Over the tropics the moon began to disintegrate; the débris was strewn far and near and after its dissolution, the power which had created the girdle flood vanished, the ocean began to get shallow and spread from the equator to the poles. The dissolution of the moon might have happened very rapidly, once the cohesion of the structure had been destroyed. The waters still circled around the earth for a while by the force of their inertia and then obeyed the law of gravity.

The flood reached the parts where the Biblical observer had his home. We remember that the ice shell of the moon broke up first and that the broken fragments reached the earth either whole or in the form of hail and rain. The largest fragments fell naturally between the tropics of the moon; the smaller ones (but still of considerable size) for a while revolved around the earth until they were broken up into hail and cloudbursts at their fall in the higher latitudes. It is this catastrophe which the writer in Genesis has described.

But the rush of the waters to the poles and the precipitation of the moon fragments in the shape of hail and rain have been described as contemporary events. The correctness of the statements that the rain lasted for forty days and that the flood covered the earth for 150 days is left to everybody's own judgment. The old writer had evidently had the intention to create by these figures an atmosphere of credibility—but they need not be considered as directly false or mistaken. Another matter is the statement that *all* animals and men perished in the flood. This can apply only to the locality which could be observed from the asylum and that could not have been a great area.

The writer of Genesis mentions as a third factor the wind which was sent by God and made the waters recede, drying the soaked earth. This wind was due to the return to the poles of the contracted air masses from the equator, which also must have exerted pressure on the receding waters. The "stopping of the fountains of the deep" happened in conjunction with the receding of the water. The ground water had to rise and fall with the coming and going of the flood waves, and if water-filled subterranean caves of a highland had connection with the sea, the openings spewed water at the arrival of a flood wave and stopped at the ebb. Thus we see from these few instances *that the words in Genesis need not be considered a product of oriental imagery, but may well be looked upon as compatible with actual observations.*

CHAPTER VII

IN THE GOLDEN AGE

WE MAY now take for granted that the Great Flood is a historical fact and that it happened according to laws of nature, as a logical consequence of cosmic events of great magnitude.

The following lines shall prove that the memory of man reaches back into the ages, when the old moon had disappeared and before the present moon had become a satellite of the earth.

In the magazine, "Weltall," 1901, appeared an article by Mind about the Proselenes in which he says: "Several historians of ancient times agree that the great age of the Arcadians was indicated by the fact that they were called Proselenes, i.e., prelunar beings. This Pelasgan tribe, which inhabited Greece before the Hellenes, boasts of having come to the country before the moon was in the heavens. This appellation is so general that prelunar and pre-Hellenic is synonymous." Aristotle says (in the constitution of the Tageates): "The barbarians which lived in Arcadia, were driven out by the later Arcadians, *before the moon appeared in the sky,* wherefore they were called Proselenes." Appollonius Rhodius, when speaking of the antiquity of Egypt, oldest of all countries, expressed himself as follows: "All the stars did not as yet circle in the heavens, not yet existed the Danaans, not the Deucalion people, but only the Arcadians, of whom it is told that they lived before the moon appeared and ate acorns on the mountains . . ."

The tribe of the Mozkas on the plateau of Bogota also believes itself to have been coeval with a moonless time, just as the Arcadians. In tropical America we also find reminiscences of the capture of the present moon. The possibility of the prelunar existence of these tribes is not denied by science, but is explained by the theory that there must have been a time when the earth was so thickly covered with clouds that the moon could not penetrate. Such far-fetched explanations need not occupy us, however, at the present time.

We have legends from all parts of the earth telling of the moonless time, and this tradition was quite general in antiquity.

These traditions indicate that man, as a thinking being, has lived on our planet for a vast period of time, at least long before the last glacial period. Life during the moonless period became easier for all living creatures, for the earth had room for many and furnished plenty of nourishment. There was neither flood nor ebb tide; only an insignificant rising and sinking of the ocean caused by the sun. There were no severe disturbances of the atmosphere, such as might be caused by a moon. For a long time the seasons were not so pronounced as now, since the axis of the earth, which had risen to a steeper position during the disintegration of the moon, had persisted in that position. Only after restoration of the old condition the temperate climate again appeared, so favorable for the development of most living beings.

If there ever has been a golden age on earth, it must have been under these fortunate conditions of the moonless age. There was harmony on earth, harmony between life and environment, between Man and Cosmos. The influence of the sun spots was felt on the earth, of course, as they brought dry years and wet years, and catastrophes were not unknown. But there was peace on earth, peace and security. One sinister thing was still missing; the hastening course of a moon in the sky; the avenging hand of an enslaved star, which threw oceans of cosmic water on the defenseless earth and suddenly with demoniacal force loosed death and brooked no harmony.

In that golden age this sword of Damocles was not hanging over the heads of our ancestors. The earth seemed permanently at peace, eternal, with no disturber in sight. Men, animals and vegetation developed and flourished freely, and if ever there was a tropical fauna in the northern latitudes, which we dispute, it must have been during this extended period of time.

Millions of years passed thus, and humanity recovered from the shock of the cosmic catastrophe and rose again to former heights of culture. Life was again worth living and civilization made greater advances than ever before. People began to trade with one another and to make war on one another. If there was a bridge between America and Europe or Africa, intercourse between the continents must have developed. The mythical Atlantis may very well have been the connecting link between the old and the new world and may have sent out colonists to spread its civilization east and west.

But humanity can look back upon a much greater age than this.

At the time when the preceding (tertiary) moon circled around the earth at about the same distance as does the present one, the distribution of land and water will have been much the same as it is today. But preceding it there was a period of time amounting to millions of years, when conditions were different, because there was no moon to draw the water away from the poles to the equator and influence the climatic conditions. During that time flora and fauna flourished luxuriously, and the mammals, which had developed since the preceding cataclysm, had a comparatively easy and carefree existence. The creatures of the ocean also found conditions favorable, especially in regard to the food supply. Coeval with these animals, some of giganitc size, man lived on earth. He was probably of much the same size as at present, for there is no reason to believe that his average height was much greater or smaller than it is now. This holds good at least for the type of man which lived in Southern Europe, contemporary with the ancestors of the present elks, cattle, and other animals.

It is not my intention here to give a fantastical description of the life and doings of prehistoric man. There are many such works of fiction extant, and I do not care to add to their number, inasmuch as such an attempt would show the same deficiencies as the others. In one respect only would it differ from all others, namely that I would *not* describe the man of the last glacial period as a savage, devoid of all culture, but rather as an unfortunate being, who had been torn violently out of a happier environment. He was gradually forced from a certain stage of civilization by the force of unfavorable circumstances, daily compelled to struggle in the direst need for his bare life or perish miserably in floods, cold, and want. And if a number of individuals or whole groups managed to escape this fate, they had to be thankful that former, more favorable conditions of life had fitted them with an intelligence which enabled them to rise above the adverse conditions, escape the worst perils, and continue existence though it be in an abject manner.

During long periods of time, elapsing until the beginning of these difficulties, mankind had learned to accommodate itself to all sorts of conditions, but many species of animals, especially the large vegetarians, had to perish from scarcity of food. A multitude of human beings perished in the waters or were buried under the débris of falling mountain walls—the solid crust of the earth was subject to swaying motions and violent volcanic shocks—but the stronger and more intelligent individuals managed to escape the perils in asylums, which they frequently had to share with fleeing animals or to defend against them.

And thus man lived on this earth through a golden age, capture of tertiary moon, cataclysm of that moon and again golden age.

But this last golden age was not to be permanent. Many millenniums may have passed, but finally another catastrophe came. The planet Luna crossed the path of the earth and became its captive.

The proud and lonely Luna became our moon. For both stars a fateful occurrence. But we are at present concerned with the earth.

Again the old drama begins. The story is repeated. The first girdle flood of a new era has begun and will inexorably proceed according to iron law. *We are now at the beginning of a new Glacial Period.*

The moon, revolving in its orbit around the equator, approaches the earth very slowly and draws the waters of the ocean together in a girdle flood, at the present time very slightly. This process will continue many thousand years, before the waters will rise to the height which they had reached eons ago, when the water flooded the earth and humanity experienced the last "Great Water."

Observations of the ocean level in the North Sea were made by the geologists Dienemann and Scharf, and we have therefore a means of measuring the probable time which will elapse until the next great flood. The water rises in a century an average of six inches, therefore in 1000 years sixty inches. You can now figure at what time in the future the flood will have reached 3000 or 5000 feet over the present level.

Observations were also made on the coasts of the Mediterranean and the results justify the claims of the two geologists, only that here the rise is much faster and amounts to 118 inches in a thousand years. This shows that not only the west coast of Europe is sinking, but that a similar process is going on in the Mediterranean countries. There is a very old tradition extant among the fishermen of Capri that in former centuries large boats could enter the Blue Grotto which is today accessible to small skiffs only and only in calm weather. The entrance of the Blue Grotto lies today below the level of the sea and the arc, forming the entrance, is easily discernible in the clear water.

The entire island of Capri has sunk 17 feet since the days of the Emperor Tiberius, who had here a villa and died here 37 A.D.

What in reality happened is that the level of the sea rose seventeen feet in about 1900 years, the waters being attracted from the northern latitudes by the steadily approaching moon.

CHAPTER VIII

CHANGES ON EARTH AFTER THE CATACLYSM

THE question has been asked, What became of the débris of the moon, after it had arrived on the surface of the earth? There should certainly be traces of it found, which are unmistakable witnesses of the cataclysm and which point to a cosmic origin. And, indeed, they can be found and several geological problems find thereby a solution.

The hypothesis of the union of earth and moons, as described, has naturally found many adversaries. One of the main objections is that a mass of the size of our present moon, if evenly distributed over the surface of the earth, would cover it to a depth of twenty-six miles. Since there is no visible evidence of such deep deposits, the entire hypothesis is refused credence.

Hinzpeter, in an article in "Zeitschrift fuer Welteislehre," a magazine devoted to the propagation of Hoerbiger's Cosmogony, replies to this that the problem can be solved by the supposition that the entire lunar mass did not descend on the earth in a shower of small pellets or fragments, like a hailstorm, but that the greater part of the metallic and mineral core consisted of gigantic, mountainous pieces, many of which, hitting the earth with enormous speed, smashed through the comparatively thin crust and disappeared in the interior.

Certain localities show where large fragments of the moon-core descended. Locating the tertiary equator and figuring from the geoid shape of the earth at the end of the cataclysm the direction these fragments are likely to have taken, he locates the main field in a zone stretching from the South Atlantic Ocean, at the latitude of the island of Trinidad, to South Africa.

There are large mineral fields in South Africa which seems to bear out his hypothesis. No fragments of large dimensions, let us say from 30 to 300 miles in diameter, can be located here, but not far eastwards, behind the island of Madagascar, is found a gigantic, semicircular wall, mostly submarine, which strongly creates the impression that gigantic projectiles, coming from the east in steep flight, had landed here and had formed this very symmetrical submarine wall.

This mighty, semicircular wall has a diameter of almost 1200 miles, and it is very likely that a veritable shower of gigantic lunar bombs struck here the surface of the earth.

Hinzpeter then follows this up with similar landing fields in other localities.

Then let us consider the problem of the Moldavites. Boelsche has a very interesting article on the origin of the Moldavites in his book "Stirb und Werde." Moldavite is a bottle-green stone with all the apparent and chemical properties of glass, and is found in small loose specimens in Bohemia. These stones are loosely imbedded in the earth, form no great deposits, and are frequently turned up by the plows of the peasants. First considered as of volcanic origin, they were thought to be a glass lava, like obsidian. Then it was suggested that they were of human manufacture, débris of old, long forgotten glass industries. In the middle of the eighteenth century these Moldavites were discovered in Moravia and it was now shown that their structure was of a peculiar type. The microscope revealed that the fine crystallized threads observed in obsidian were missing. It was also remarked that there were no signs of volcanoes in the neighbourhood of the places where Moldavites were found.

The supposition that they were the débris of prehistoric glass factories seemed to be the only solution of the mystery and promptly all Moldavites were removed from the mineralogical collections as being the product of human industry. But in 1844 no less a scientist than Charles Darwin reported the finding of a bomb of real volcanic obsidian glass in Australia, and, strange to say, hundreds of miles away from any volcano. And shortly thereafter, when the discovery of gold was made in Australia, Moldavites were found in ever increasing numbers over an immense area, almost over the entire continent and also in the nearest islands, e.g., in Tasmania. Again there were no indications as to their possible origin. Could there have been prehistoric glass works in the interior of the Australian continent? The idea was too fantastic.

In the meantime similar stones, called billiton, were found on an island between Borneo and Sumatra. And later they appeared in Borneo and on the entire archipelago. Under the circumstances it is impossible to think of their industrial origin. Immediately the Moldavites were replaced in the mineralogical collections of museums. Among the most extravagant surmises as to their origin it was now suggested that they may have fallen from the sky as meteors. But meteors are almost invariably of iron or nickel composition, and not one had been found to contain material like obsidian. The Hollander Verbeek, an expert on billitonites, advanced the theory that they were volcanic products coming from the moon.

How close to an actual solution of the mystery he came! But it was his theory that the volcanoes on the moon had such an enormous explosive power that these fragments were propelled so far that they left the gravitational field of the moon altogether and were attracted by the earth. Boelsche now follows this theory, which seems to him quite plausible, except that he doubts that the craters of the moon are of volcanic origin. There are too many differences between them and the terrestrial volcanoes. He holds that the question as to the origin of the moon craters is still an open one.

Then came the Vienna scientist Franz E. Suess with an essay entitled: "The Cosmic Origin of the Moldavites." Suess maintained that the Moldavites were real meteors and that their characteristic appearance was due to friction with the air in their fall through the atmosphere. At present, therefore, Moldavites are considered as of meteoric origin. But think what a hail of glowing glass must have bombarded the earth in Bohemia, Australia, in Borneo, and in the entire archipelago of Southern India! Does it not seem that the Glacial Cosmogony of Hoerbiger contains the answer to this riddle?

The Moldavites are clearly part of the hail of molten moon-substance which bombarded the earth during the cataclysm of the tertiary moon. If you follow on a globe the places where they are found, you will find that they form a closed ring around the earth, which strengthens the impression that they were strewn from cosmic space.

It is very significant that deposits of gold, zinc, and other metals follow in the track of the glass meteorites. It is supposed that the heaviest metals form the centers of heavenly bodies and, as this would hold good in the case of the moon, it is natural that metals will be found in the neighbourhood of the mineral fragments. This is actually the case. We also find large blocks of metal over the whole earth which have no geological connection with their surroundings. They are isolated ore mountains. In India are several places where rich iron deposits lie on the surface of the earth and also metal mountains which are imbedded like splinters in the skin of the earth.

Similar blocks are found on the island of Elba and in Siberia and in many other places. Nobody would suppose that they have been raised from the interior of the earth. But where did they come from? They are also fragments of the last moon-kernel which were not large enough to penetrate the crust of the earth.

There are found, in various places on earth, great scars or craters, believed to have been made by giant meteors. One is "Meteor Crater" measuring nearly a mile from rim to rim, at Canyon Diablo, Arizona, which is 575 feet deep. Meteoric iron has been collected here to the weight of about 30,000 pounds. A little calculation shows the impossibility of this theory, for a mass of 30,000 pounds of iron with a specific weight of 7.8 in spherical form will have a diameter of about five feet! Not such a giant meteor after all. And if 1000 times as much iron should be found, the diameter of the mass would not exceed 50 feet and a million times the weight of iron makes a body only a little over 500 feet thick. How can such a small body cause such an enormous hole?

Then there is a collection of greater crater scars in South Carolina. The discoverers, Professors F. A. Melton and William Schriever of the University of Oklahoma, estimated that the marks were made by a mass of meteors which perhaps formed the head of a comet. The impossibility of such a theory is evident, in the light of what we have learned of comets.

The most convincing facts are furnished, however, by the loess fields on earth.

There is a wide distribution of these immense deposits. The German Scientist von Richthofen traces their origin to layers which were swept together by the action of strong winds. For want of a better explanation this theory, although plainly impossible, is still adhered to in certain quarters.

We have heard that at the breaking up of the moon-body immense quantities of earthy matter descended, which had formed the former ocean bottoms. Great masses of it fell in certain localities and the seas at these points were saturated with the loess. When the waters receded from the girdle flood these masses were carried along and finally deposited in regular layers. It has been admitted that the loess fields, particularly the immense deposits in China, must have been deposited by the action of water and that fits in perfectly with our explanation which makes them remnants of the earthy moon material.

This also explains the immense quantities which are found and which form a considerable part of the fertile ground of our planet. The loess fields are probably most conspicuous and rich in China, where they are several thousand feet thick. We can follow the deposits on a globe, stretching across the Pacific Ocean, across North America, Central Europe, Russia and Western Asia in a circle. In the southern hemisphere we find them in the endless pampas of Argentine. There are altogether about six million square miles of loess deposits on earth, sufficient, if evenly spread, to cover the entire earth about three feet deep. And this does not take into consideration the immense quantities which probably cover the ocean bottoms and which were distributed by the action of water.

The problem of the origin of these immense deposits has never been solved by the scientists, although a voice was heard, here and there, suggesting a cosmic origin, but no astronomer has ever tried to explain them according to his science. Their distribution in a circle around the earth agrees perfectly with the theory that they are the result of the great flood after the last moon cataclysm and this explains also why some latitudes north and south of the equator are free from them.

CHAPTER IX

THE PROBLEM OF THE LOST ATLANTIS

MILLENNIUMS of the golden age went by. The oceans were of a uniform level, as no moon drew the waters to the equator, and large stretches of land were inhabited which are now submerged under the ocean. The oceans had spread toward both poles and the equatorial seas, in spite of the gain of water from the lunar ice shell, had become shallower. The African coast rose from the water farther toward the west than at present, because now again there is a deeper girdle of waters, caused by the present moon's attraction.

The mouth of the Congo river was consequently far out in the Atlantic Ocean and today we can measure and follow its course to a distance approximately 100 miles from the present shore under the water. To a distance of forty miles from the coast the river bed forms a canyon of a depth of about 3000 feet. The old strandlines in Norway and Siberia indicate how high the water rose in the northern latitudes. Contrary to general opinion, the coast did not rise in these regions, but the ocean sank. The west coast of Africa is not sinking now, but the level of the sea has risen.

This is one of the most important claims of the Glacial Cosmogony, contrary to the theory of geologists that entire continents rose and sank repeatedly, although insignificant disturbances of this kind are admitted. In connection with the statement that large areas of land were subject to great changes of level, Boelsche asks the significant question why it is that the earth always had a "swollen cheek" on one side only, while on the side of the Pacific Ocean everything had been in the best of order. We can only repeat: Before the capture of the present moon the equatorial level of the ocean was several thousand feet lower than it is now and the existence of a connecting land-bridge between Africa and America is strongly to be presumed.

Highly civilized people lived on earth; art flourished, commerce prospered, there was intercourse among the nations, religions were founded, even the beginnings of science are discernible. It is certain that the Mayas, a people who flourished in the present Yucatan and Venezuela, were far advanced in astronomy and their calendars have been found and were lately interpreted. The astonishing discovery was made that their calendar was based on the movements of the planet Venus and that nowhere mention is made of the moon. The moon evidently never entered into their astronomical calculations, it did not exist for these people. This ancient race, which built remarkable cyclopean structures and left a large amount of sculptures in the jungles of Central and South America has vanished from the earth.

Many generations of their astronomers must have observed the movements of the planets and must have noticed that one of them seemed to grow gradually brighter. It finally surpassed all objects in the sky in brightness and size. This was the planet Luna, our present moon, gradually shrinking its orbit and approaching the earth.

Had these ancient sages been able to calculate the elements of the orbit and had transmitted their observations to posterity, it would have been of incalculable value. But this they did not do; certainly no such records have ever been found in America, nor in Mesopotamia or Egypt.

And the star came nearer and nearer, it became of measurable size and created probably terror of a collision. This was avoided for a long time, but finally a catastrophe happened, but in an altogether unexpected manner. At the final approach the star could not escape from the gravitational pull of the earth. It shot toward the earth, seemingly as large as a "hand-mill stone," came nearer than its present orbit and, following the law of inertia, tried to escape. It did not succeed, but was forced into the rôle of satellite.

The capture was again a sentence of death for innumerable living beings. A flood-wave, mountain-high, raced suddenly, steeply erect, toward the equator, burying and destroying everything in its path. The approaching planet grew quickly, until it reached the size of a bright disc, as which we see it today. But at that time the good-natured "face" of our moon was still missing. There was a shoreless ice ocean which, under the gravitational force of the earth, began to break up into gigantic floes.

The water underneath the ice became free and was partly pressed out. At the same time the last remnants of an atmosphere must have disappared and on the almost pressureless surface, the water began to boil in spite of the icy cold, and the resulting vapor was driven so high that it escaped entirely and disappeared into space.

It must have been a wonderful spectacle. A seething star! The moon, covered with ghastly, dark spots, where the water had appeared, drawing behind it an immense curved tail of vapor like a giant comet, glittering fantastically in the reflected light of the sun, appeared to our ancestors as a fiery dragon in the sky, which threatened to devour the earth.

The inhabitants of Atlantis, Lemuria, and the Easter Island realm saw this spectacle only from the highest mountain peaks and could observe from there how the dragon within a few decades changed into our peaceful "light of the night."

But millions of people perished in the great flood at the capture, and ancient civilizations of high value were destroyed.

This cosmic event was not as fateful for the earth as the destruction of the tertiary moon had been, but for certain regions on earth it held terrible consequences. With the moment that the moon adjusted its path to circle around the earth, catastrophal changes resulted in the tropics. It suddenly attracted by its mass considerable quantities of water from the higher and colder latitudes and heaped them up around the equator.

The new satellite was about twenty-three hours slower in its revolution than the rotation of the earth, the same proportion as is maintained today, and compelled the waters drawn to the equator, to circle around the planet in a contrary direction to the earth rotation. In other words the first beginnings of a girdle flood are already in existence.

This swell of the waters remained over the equator under the gravitational pull of the moon. Atlantis and everything else which had been submerged, are still under the waters.

No student of human tradition is likely to encounter among the annals of his science a tradition so persistent, so powerful, none that makes such an appeal to the human imagination, as this tradition which tells of the great island-continent in the Atlantic Ocean, which was civilized and powerful and then disappeared in one day under the waves of the sea in a mighty cataclysm.

A large library of books has been written on the subject of Atlantis and it has been located at various points, the latest hypothesis, by Frobenius, claiming that it was on the continent of Africa. But the old, well-known story of Plato, from which all speculations sprang, and which locates Atlantis in the Atlantic Ocean, opposite the Pillars of Hercules, seems to be the most likely true one.

The Troano manuscript, probably a work of the Mayas of Yucatan, corroborates the story which Plato tells. Thus we have evidence from Greece or Egypt and from the New World. The manuscript calls the island-continent Poseidonis, instead of Atlantis, and describes how the submergence was accompanied by mighty volcanic and other subterranean phenomena. "Unable to withstand the terrific battering," says the manuscript, "the lands of the island of Poseidonis sank under the waters, drowning the sixty-four million inhabitants."

Some secret Indian manuscripts are said to tell the same story.

Plato's account is the only one of documentary nature which gives direct evidence of the existence of Atlantis and there is nothing improbable or fantastic in his story, nor does the philosopher seem to write of a utopian state.

For those who are not familiar with the Platonian tale, I shall give a short résumé.

In one of his dialogues he makes his spokesman tell of a visit which Solon the great Greek lawgiver made to the priests of Saïs, the ancient Egyptian city, and how he learned from these priests certain facts of the ancient history of the Egyptian people, a history which goes farther back than the human mind is wont to think of in connection with our race. Plato tells that about 9,000 years before Solon's time Greece was attacked by a mighty sea power, which came out of the West and tried to conquer the world. Their homeland was situated beyond the Pillars of Hercules, on isles in the Western Sea, and was greater than the whole of Greece, Egypt and Northern Africa put together. It was the pathway to a still greater continent on the shores of the "true ocean," for the Egyptian priests knew that the Mediterranean was only an inland sea. The largest body of land in this group of islands was called Atlantis, a large and powerful empire. The gods sent a catastrophe and in one terrible night the entire island was swallowed by the sea and all men perished. Atlantis is then described as an unusually beautiful country, of mild climate, without wild animals, fertile and watered by hot and cold springs.

The inhabitants dug out of the earth various metals, among them copper, which was very valuable to the men of that remote day, and cultivated the fields, raising fruit and vegetables of all kinds, among them a nut which furnished drink, meat, and ointment. They constructed temples, palaces, harbours, and docks. The palace of the king was situated on an island, where a sacred mount of small height rose, and there was the temple of Poseidon, reared with great barbaric splendor. The buildings were constructed of red, white or black stones which sometimes alternated in the same structure. The people lived under just laws under a sort of feudal government and were a maritime trading nation with colonies and connections all over the known world. In time they became overbearing and proud and Zeus the father of gods and men called all the gods for council into his holy habitation and spoke to them as follows: [Here the account of Plato ends abruptly, death having stopped the pen of the philosopher.]

One of the most famous and scholarly of the books written on the problem of Atlantis is by Ignatius Donnelly, and he has gathered with great ingenuity and labor a multitude of facts, which furnish a rather conclusive proof for the existence of the ancient Atlantis, at the place where Plato puts it. Many more modern writers have added to that and have made out a very convincing case.

There is a mysterious resemblance between the architectural structures of America, Egypt, and the Celtic countries, and the lost Atlantis is the only solution for a great number of cultural, linguistic, and traditional coincidences. The fact that the bed of the Congo River can be followed into the ocean for miles, indicates that the ocean must formerly have been much shallower. Parts of the Atlantic bottom rose out of the waters as a continent, with the Canary Islands, the Azores, and the Antilles as their highest mountains. An extensive ridge has been found in this region of the ocean bed, which lies not far below the level of the water, and probably marks the site of the lost continent. The sinking of such large areas of land is not probable, but a rising of the sea level quite likely. Its cause was a cosmic force, the capture of the moon, our present satellite.

In the Museum for Oceanography in Berlin there is a plastic model of the bottom of the Atlantic Ocean according to the measurements made by the German ship Meteor. The illustration 15 (after a photograph) shows the islands rising from the base like pointed needles, but this is due to the fact that the exact proportions could not be maintained, since the width of the ocean, if modelled in proportion, would have made the size of the model prohibitive. The elevations have therefore been made a hundred times their relative height.

According to the Glacial Cosmogony the ocean in the vicinity of the Azores rose about 7,000 feet. Now imagine a clay model of the Atlantic bottom inside a case and the case filled with water in conformity with the present level of the ocean. Allowing sufficient water to flow off to reduce this level by 7,000 feet proportionately, one will see an island appearing in the neighbourhood where the Azores are located; an island lying before the Pillars of Hercules, with the present Azores islands reaching into the sky to mountainous heights. Plato says that Atlantis was 200 miles broad in the middle, and a measurement of this island, which rises out of the Atlantic by lowering the water level, shows that it is approximately 200 miles across. The illustration 16, which is the first authentic map of Plato's Atlantis ever made, was taken from an article on Atlantis by Major Bilau in "Schlüssel zum Weltgeschehen," 1932, No. 2.

It seems that the old Egyptian priests at Saïs gave rather exact information to Solon, their Greek guest and ancestor of Plato. Coming from the east the

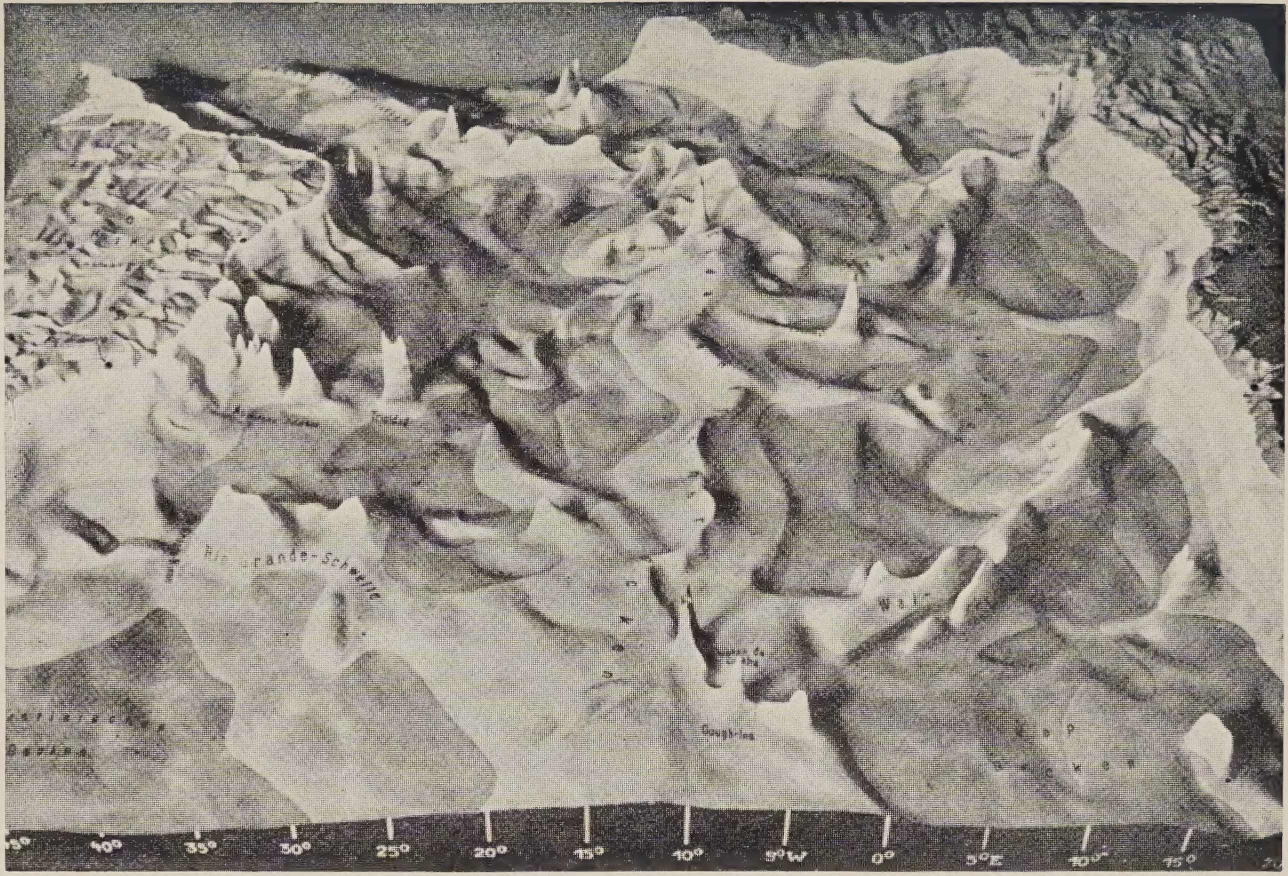
Rio Grande-Schwelle
Gough-Ins
40°
35°
30°
25°
20°
15°
10°
5°W
0°
5°E
10°
15°

FIG. 15.

A plastic model of the bottom of the Atlantic Ocean according to the measurements of the "Meteor" expedition. The elevations are 100 times as high as the actual proportions. The original model is in the Museum for Oceanography in Berlin.

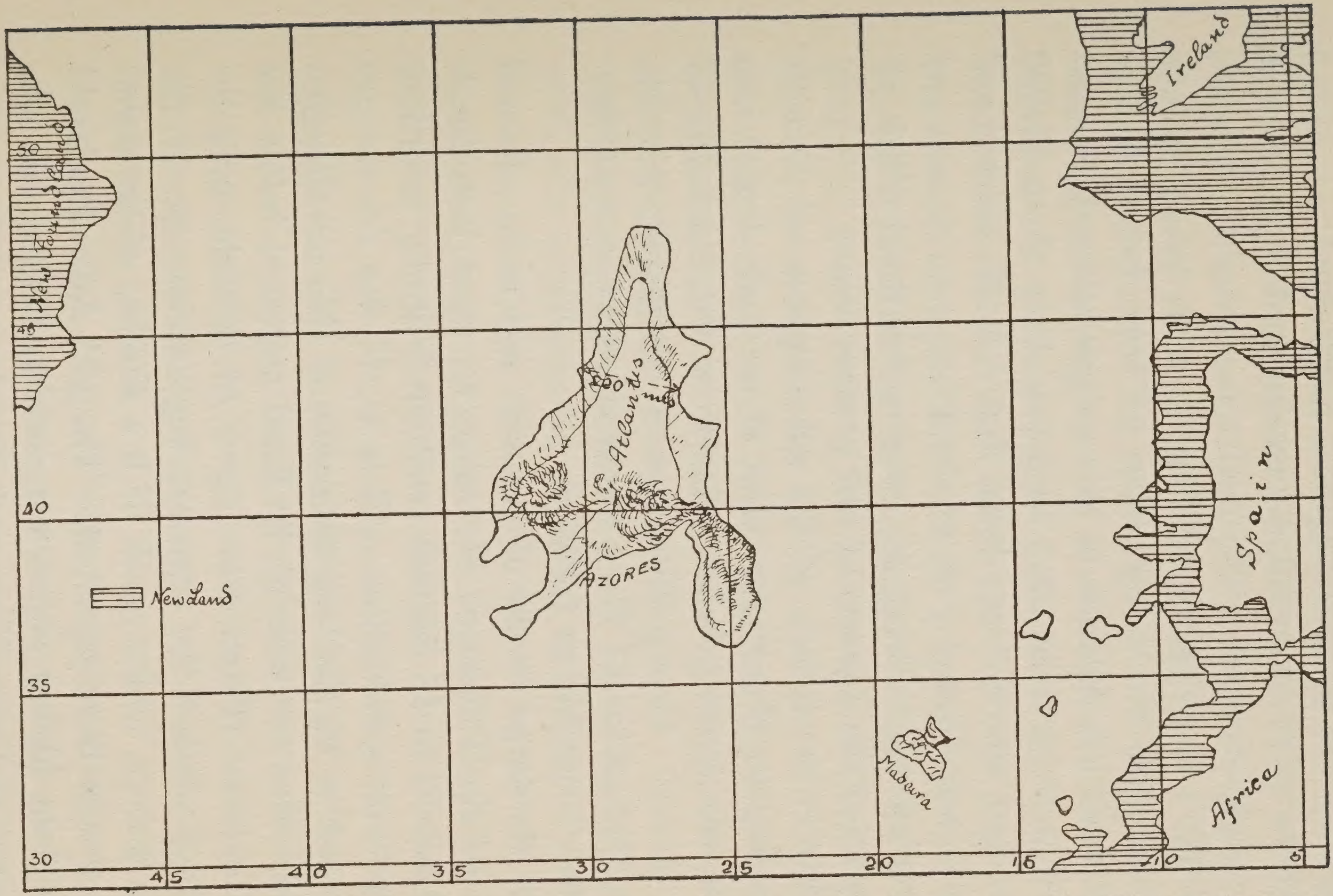
New Found Land
50
45
40
35
30
New Land
Atlantis
200 mls
Azores
Madeira
Ireland
Spain
Africa
45
40
35
30
25
20
15
10
5

Fig. 16. A Map of the Neighbourhood of the Azores Islands, as It Would Appear, if the Level of the Ocean Would Sink about 7,000 Feet.

island rose steeply from the sea. The capitol lay on a square plateau in the south, surrounded by mountains and well protected against north winds.

There were beautiful mountains and high lakes in the neighbourhood. The entire topography conforms to Plato's description of Atlantis and, taken in connection with the composition of lava found on the bottom of the Atlantic in this neighbourhood, indicating that there must have been land here about 13,000 years ago, we need not doubt that Atlantis existed and that it was located just where Plato says it was and was submerged during the catastrophal flood which accompanied the capture of our present moon.

This is the theory of the submergence of Atlantis according to Hoerbiger. But if we look deeper into the matter, grave doubts arise as to the feasibility of this theory. Georg Hinzpeter in his excellent work, "The Formation of High Mountains by Cosmic Catastrophes," reasons as follows:

"If the large island of Atlantis was really situated west of the Pillars of Hercules, we must look for it in about 50 to 55 degrees northern latitude, according to prelunar orientation. That is, if the Azores are supposed to be the last remnants of this antediluvian world. But the new girdle flood appeared below the 35th degree. From this degree of latitude, only increasing toward the equator, begins the rise of the ocean waters, whilst north of it a sinking of the ocean level would have occurred. The old Atlantis should have risen higher above the waters, instead of submerging, and even if we seek the site of Atlantis farther south, the problem becomes no clearer, for the level of the ocean remained here unchanged or rose very insignificantly. But the ridge between New York and Gibraltar is, according to soundings, still over 6,000 feet under water. Consequently other circumstances must have been responsible for the catastrophe, if the flood at the capture of the moon is to be considered the cause of the submergence."

During the moonless period the site of Atlantis was on the top of the egg-shaped distortion which had been left from the disintegration of the tertiary moon. Our moon came at the time of capture dangerously near to the earth and gripped through its gravitational force, the thin crust of the earth much stronger than now, dragging it backward. Everywhere the firm crust of the earth cracked and broke, stresses of immense strength were at work, and only a comparatively insignificant cause was needed to bring forth one of the greatest geological changes on earth.

This critical moment occurred when the egg-point with the superimposed Atlantis was directly beneath the moon. At the same time, when the waters of the northern seas raced toward the equator, the connection between the Atlantic floe and the eastern hinterland broke. Whether it was a complete fracture or only a gigantic flexure, it was sufficient for the new satellite to split the connection and Atlantis, torn backwards, sank several thousand feet into the depths as a titanic floe-break to remain submerged in the Atlantic Ocean until today.

It would be of great value to paleontology to know the approximate time of the destruction of Atlantis. Calculations could hope to succeed only, if there were at our disposal a definite value for the resisting medium in space. This would indicate the progress of the gradual approach. Historical traditions, which would permit us to arrive at approximately safe data, are not in existence.

An extensive literature has been written on the subject. According to Plato the Egyptians told Solon that the catastrophe happened 9,000 years before their time, which would make it about 13,500 years ago. The Chaldeans however claim that a period of 39,000 years lay between the flood and their historical dynasty. According to deductions by Hoerbiger it must have been much earlier, and it is possible that the Chaldeans refer to some other flood. In any case, 13,500 years seems far too low an estimate.

The reappearance of Atlantis will depend on how high the sea level will be after the dissolution of the present moon and the amount of water it will deposit on the earth. The time, of course, cannot be determined with any degree of certainty. Hoerbiger made some calculations, but admitted that they needed revision.

CHAPTER X

THE MYSTERY OF EASTER ISLAND

ANOTHER unsolved problem is presented by the mysterious island in the Pacific Ocean, called Easter Island. It is one of the most lonely spots on earth. The coast of South America is over 2,000 miles east of it and the islands in the west are almost as far away, and a strong wind is blowing from Easter Island toward them most of the year, which would have made communication in the days before steam traffic almost impossible. Even today, when it is exploited as a grazing ground for cattle by a Chilean Company, the island is now Chilean territory, a steamer calls only once a year at the most and sometimes not that often.

During the late war it came into prominence as a refuge for the crew of the Sea Eagle, the German raiding vessel, and the German squadron under Admiral Spee lay here for several weeks, but they made no researches, being probably occupied with other matters. It is not a place anybody with any sense would voluntarily choose for a place of residence.

It is a volcanic island 3 x 13 miles in area rising abruptly out of the wild surf of the Pacific Ocean, constantly swept by strong trade winds, and bare of trees. There are not even the usual palms to break the monotony. There is no running water. At the southern end of the island rises a large extinct volcano to a height of 1400 feet, the crater of which contains a lake, fed by the very frequent rains. There are more than a dozen other craters on the island which make the landscape mountainous and forbidding.

There is nothing charming or fertile or peaceful about it anywhere. Altogether a place unlikely to attract a people of culture or to become the seat of any kind of civilization. And here comes the impenetrable mystery which still shrouds Easter Island. Here are mighty traces of a civilized people, belonging to the stone age, which have disappeared and left their work behind them to become one of the great riddles of the age.

The traveller who lands on Easter Island is greeted by an extraordinary sight, found nowhere else on earth. The mountainside is literally covered by hundreds of gigantic images, from 6 to more than 30 feet in height looking grimly toward the sea. They are all of the same style and general appearance, male figures sculptured from the waist up standing upright in the earth. And there are hundreds of the same kind lying fallen and broken on terraces and other places all over the island. Some stand lonely by themselves, others in groups, on the volcanoes, in the plains, some inside the craters on the steep declivities of the crater walls. They are primitive, almost threatening in expression, different from the type of man now living on Easter Island, but seen from a distance they appear dignified, gazing in impenetrable calm over land and sea, and one receives the impression that they have been there looking over the sea for untold ages, that they are witnesses of a past that is lost in the distant gray of vast antiquity, that even the tradition of man has lost all trace and all knowledge of the meaning of these grim relics of the morning of the human race.

Everywhere these remarkable gigantic heads with low foreheads, deep eyes, long ears, great concave noses and firmly closed lips—a strange enchanted world without parallel anywhere else on earth.

But the mystery of these stone images grows when we see how they were produced, and that can fortunately still be studied. The ancient work places are still in existence, hardly touched, and we find here statues by the hundreds in all stages of manufacture. *How* these images were produced is answered, but the *why* and *what-for* is still dark. To pay any attention to the traditions of which the natives tell is futile. Their tales are childish and in no way on the same grade of intelligence as the makers of the images must have possessed.

That such immense sculptural works should have been made by the inhabitants of this lonely island is incredible. The number of skilled workmen, engaged generation after generation must have been out of all proportion to the number of inhabitants which the island could possibly sustain.

We have here no great nation, like Egypt, with hundreds of thousands of slaves at its disposal, but only a few thousand people, on a bare island, far from intercourse with other men. And what could have been the possible purpose of such works?

The state of the quarries shows clearly that they were abandoned suddenly, that some catastrophe had happened which drove the workers away in the middle of their labours. What was it? When did it happen? The natives answer these questions only with inane fairy tales. The clue to the mystery lies plainly somewhere else. And then you see hundreds of these giants in the interior of a crater near the overgrown crater lake standing with their backs to the mountain wall. They could not have waited here for transportation to some other place, for it would have been impossible to get these ponderous masses over the crater walls. They are firmly imbedded where they stand and evidently intended to stand there. But why and when did this happen? And then we have the unsolved problem of transportation. How did they get these giants over hill and dale through the difficult region of the island sometimes miles away? There is no wood on the island and beams and rollers are out of the question. There is no material out of which strong ropes could have been manufactured. The weight of the statues is from ten to twelve tons, but the largest might weigh as much as fifty tons. This would not tax the ingenuity of a modern engineer with modern tools, but how about doing it under the circumstances? We stand here before a complete riddle which no theory has been able to solve.

Another problem in connection with these images has been observed. It has been noticed that the images were arranged in a certain systematic way and it has been found that they followed the way of an ancient road, where every hundred steps stands one of these giants. On the short route were twenty-seven statues, and after observing this it was easier to find the course of other evidently ancient roads. From this it appears that they were ceremonial or triumphal streets, lined with these sacred figures. But even that brings the mystery no nearer to a solution, because it upsets the theory, the only one extant so far, that the builders were from the Polynesian or Melanesian islands. Nothing similar has ever been seen anywhere in these islands and that emigrants to this lonely isle should have evolved a distinct religion and art, is to say the least, very unlikely.

There is only one solution to the mystery. Here was once a great continent, an empire, with a large population, and when the girdle flood of the tertiary moon raced around the equator, these regions must have been submerged. The inhabitants of the Easter Island Empire were forced to take refuge on the mountains and only the highest peaks rose above the immeasurable flood. With the destruction of the moon and the ensuing "Great Flood" of the waters, which receded in this region, the survivors descended again gradually into the new-appearing plains, but the asylums on the peaks which had saved the race, remained in its memory the "Holy Mount." Here were buried the Great Ones of the nation, the heroes and kings and priests, and here took place the sacrifices, the rites in memory of the delivery from the cosmic monster, and here were erected the giant statues.

Thus for long ages the "Holy Mount" was venerated and held in awe. Then came the catastrophe at the capture of our moon and the Empire was again submerged, leaving the mountain as a lonely island in the waste of waters.

What the empire was that flourished here, we have no way of knowing. There was no Plato, no Egyptian tradition of the East to leave us a message, be it ever so mysterious and meagre. But we can reconstruct now the scene as it might have been. The great continent, teeming with people, the immense structures, to judge by these Easter Isle giants, the sacred mountain, once spewing fire as an active volcano, but now a place of pilgrimage, where the holy men abode and hewed the sacred figures out of the rocks and set them upright. Hundreds of them, to be used in the sacred rites and the burial places for the great of the nation on hallowed ground, high above the plain and the towns of men.

A recent German work on Easter Island mentions the hypothesis of the sunken continent, but dismisses it immediately as absurd, because measurements have determined an ocean depth of about 12,000 feet right around Easter Island. This seems, of course, at first sight, a final argument because no sacred mountain quarries would be located at that height, far above the eternal snow line, even here in the tropics.

But there are arguments to meet this objection. The profile of the bottom of the Pacific Ocean may have undergone significant changes, caused by the earthquakes at the capture, which is the more likely, as we have here a volcanic region which is always somewhat unstable. The depth-lines of today are no proof that such depth existed ages ago when the catastrophe of submergence occurred.

Lemuria, the third hypothetical continent, was supposed to be situated between Madagascar and South Asia. There is no memory of it left among the people of the earth, neither ruins, as in the case of Easter Island, nor tradition, as in the case of Atlantis.

There was evidently no culture there of any importance, and whilst the former existence of this land-bridge can be demonstrated geologically in the light of the Glacial Cosmogony, we may refrain from going farther into it at this time.

CHAPTER XI

THE AGE OF THE HUMAN RACE

THERE was a time in the history of the solar system when the vast space between the sun and the farthest planet was crowded with a multitude of planetary bodies. Gradually the space was cleared—those bodies nearest to the sun were absorbed by it, and the others combined with the larger bodies nearest to them, until now only comparatively few—only nine as far as we know—large bodies are left which circle as independent planets around the central sun. All others were captured by the sun or by these nine planets and absorbed into their mass; only a few of the captured bodies still revolve around their planets as satellites or moons, but the process is still going on, and in the course of time these also will be drawn nearer and nearer to their planets and finally embodied in them.

Our earth has already absorbed at least three of these satellites and the fourth one, the quaternary moon, is now our "companion of the night." As we have seen, the dissolution of a moon is connected with fateful consequences to the earth and its creatures, and the memory of such a cataclysm has made such an impression on the minds of our ancestors that the story of it will never die in the memory of the race. And so we find today traditions among all people, even among very primitive ones, which tell of a world catastrophe, of the earth trembling in its foundations, of storms and great floods and flaming mountains and of stars falling and the cessation of all time. Such universal traditions, it is admitted, must have some foundation in fact and if we study them in the light of the Glacial Cosmogony we shall perceive that they are indeed descriptions, and sometimes very accurate observations, of a cosmic world catastrophe through which our ancestors lived. It has been found that man has lived on our planet for a vast period of time, at least long before the last glacial period.

All over the earth we find mighty traces of lost civilizations. I have mentioned some of them, as the mysterious statues of Easter Island, but in the middle of deserts and almost inaccessible jungles have been found the ruins of gigantic cities and cyclopean buildings.

It would tax the ingenuity of modern engineers to duplicate the feats of transportation of heavy weights which these unknown ancient peoples have accomplished. It is usually supposed that by the primitive means of ropes and rollers and unlimited human slave power, with perhaps systems of block and tackle, now lost, and the erection of earth ramps, such structures as the pyramids, in the old and new world, and the gigantic temples, forts, and palaces strewn all over the world, have been built.

But we find cyclopean blocks, hewn and polished and fitted together with mathematical exactness without the use of mortar, where they must have been transported across Titicaca Lake, when the natives know nothing of heavy ships which could float such weights. We find them on almost inaccessible rock ledges with only a foot path leading to them, on coral islands where they must have been carried by heavy shipping and often many miles away from any possible source of supply.

This almost universal system of erecting cyclopean buildings, towers, and monuments leads to strange thoughts. First that there must have been a connecting link among all these very ancient civilizations and second that they were erected for the same purpose or with the same underlying idea in the minds of the builders.

What could that possibly have been? It must have been an experience which was shared by all humanity and which was so terrible that it spurred the people to almost superhuman efforts, to protect themselves against a possible recurrence.

The universal tradition of death by flood and fire, of cosmic monsters, battling in the sky with the gods, and of the salvation of a few favored survivors gives us the clue.

It seems reasonable to connect these building activities with the moon cataclysms and the fear of a repetition of a flood and rain of fire from heaven. They were intended for refuges. The mighty pyramids, towers and forts on mountain tops were to save men from the immense flood, should it occur again, and the grottoes, caves, and low but very heavy buildings from the cosmic missiles accompanying the cataclysm.

This is the only theory which accounts for the universality of the practice and for the choice of location on lofty heights. There is no doubt that all ancient cultures are in some mysterious way connected, the similarities cannot possibly be coincidences or be the consequence of casual communication by stray wanderers. And here comes the story of the lost Atlantis as the connecting link between the ancient peoples of the earth. It must have been the mother of all the prehistoric civilizations and given the impetus which carried them all over the ball of the earth. In the course of millenniums they were then changed to correspond to climatic and local conditions.

The usual estimates of Palæontologists as to the antiquity of man are far too low, whether these be given as 10,000 years or 100,000. According to Hoerbiger our ancestor, probably of the type of the Neanderthal man (tertiary man), was a witness of the tertiary cataclysm. He survived the last great flood and between that and the capture of our moon lie perhaps many millions of years. Sometime in the future the age of man may be estimated as high as 100 million years by scientists, but even if you reduce the figure to half of Hoerbiger's estimate, the antiquity of his tertiary man far surpasses all present calculations.

The inhabitants of Atlantis, like those of Egypt, belong to the present, the quaternary period. The glacial period and the next great flood, to be caused by the approach and dissolution of the present moon, still lie far in the future.

The gigantic prehistoric animals disappeared and have become legendary, but man in his various stages of evolution as well as the lower species of ocean creatures, survived several cataclysms. It was by man's intelligence that he escaped from dangers of destruction and by which he adapted himself to changed conditions of life. The sea creatures felt no such changes; of these the lowest species suffered the least, so that it is not strange that they show so little evolutionary change. The lowest sea creatures survived four glacial periods. The human race, already on a comparatively high step of evolution, certainly survived the last one.

There is nothing to indicate that man has evolved from a low type of fish to a higher organism during the intervals of time known to us. But neither is it likely that he entered this world as a finished product. We may conclude that a being, capable of developing into man, must have a long past, as long at least as that of the ocean creatures. His intelligence must have surpassed that of other beings, and from it evolved the reasoning power which placed him at the head of life on this planet.

Every geological epoch was preceded by a long moonless period when a certain evolution of those plants and animals took place, which survived the preceding great cataclysmic flood. Those best fitted for the struggle for existence then populated the "new earth." Only such fossils of the old fauna and flora remained as were imbedded in ice, safe from decay. Everything on land and in the water which perished was covered by mire and loess, unless preserved in ice, rotted and disappeared, leaving but a few insignificant specimens, such as teeth protected by enamel. For this reason we shall not find better preserved remains of our ancestors or land animals.

One of the most perplexing problems of Palæontology, the science which treats of the structure, classification, and distribution of fossils, finds its solution in this fact. You know, of course, that fossils are the remains of animals and plants found embedded in rocks and thus preserved for untold ages and that the study of these structures enables the scientists to reconstruct the forms of animals and plants which were on earth eons ago.

Biologists, working according to the Darwinian Theory of Evolution, find many inexplicable gaps in the development of various species. These are the mysterious "missing links," which have puzzled the scientists for a long time. They find a natural and logical explanation in the recurrence of these immense stretches of time, when no moon was in the sky, lasting perhaps millions of years. Between them lie the comparatively short periods before and during a moon cataclysm, when the earth was covered with ice and great masses of dead animals were carried by the floods and imbedded and frozen.

But during the moonless ages conditions were not favorable for the preservation of fossils and dead bodies disappeared by decomposition. Thus becomes the "missing link," another proof for our theory of the geological ages, which are separated by moon cataclysms.

Remains of human beings, which perished at the last cataclysmic flood, may perhaps be found in the ice in Siberia, where also the remains of tertiary mammoth are preserved. Romancers have often described events which later became true, and recently a novel was written around the discovery of a tertiary maiden enclosed in the Siberian ice. It would be a wonderful coincidence, if perhaps explorers of the future should find a human being conserved in its icy covering. It would be near-sighted to consider such a possibility as fantastic.

Finally I wish to point out that all ancient tales and myths of fights with dragons, etc., have also a certain basis of fact. Racial memory is persistent and racial tradition is very strong. The tendency of science is to attribute to the race a much greater age now than was done heretofore, and there is nothing impossible in the picture of our ancestors in fight with monsters of the Saurian type. In any case, it was Hoerbiger who first advanced the theory of the great antiquity of the human race and made the attempt to show that the cataclysmic rhythms of the earth life were experienced several times by human beings. Therefore he speaks in general of a tertiary, secondary, and primary man. Each of these types survived the approach and disintegration of an earth-moon and was witness to the play of cosmic forces which shaped the face of the earth in its principal features.

But let us leave the study, experimentation, and proof connected with these problems to the science of Evolutionary Biology.

PART V

THE PLANETS

CHAPTER I

About Planets in General

We have made the acquaintance of three kinds of heavenly vagabonds, which come to us from the farthest distances of our world island. Now we shall occupy ourselves with the more sedentary members of our solar system, the planets. Of these, nine are known to us at the present time. Named in the order of their distance from the sun they are Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune, and the newly discovered Pluto.

Contrary to the present theories we deny that the planets originated from masses which were thrown out from the sun by centrifugal force. On the contrary, as explained, they were born at the same time as the sun, were children of the same mother star, born at the moment when, eons ago, an explosion took place on a giant star, which propelled a mass of star-substance like a projectile into cosmic space. The escaping chaos adjusted itself slowly to a system, the sun became the center of gravitation, other parts became sub-centers and from these the planets were later formed.

In the giant cloud which consisted of ice bodies on the outside, and of steam farther in the interior, there moved the liquid incandescent projectiles. Of a high specific weight, they dominated, according to their size, a certain range of gravity and attracted to themselves from this field smaller bodies, meteors and especially ice blocks which were again turned to water or steam by their heat. Those, which moved in a part of this cloud, especially saturated with this material, retained a certain amount of water and embodied it. This could, of course, happen only in the vicinity of the slowly forming sun because the cold of cosmic space could not approach it so closely. For this reason the nuclei of these planets revolving near the sun had no or very little opportunity to attract ice bodies whilst those farther away from the center, moving in a very icy atmosphere, enlarged in volume constantly by the capture of such bodies. As a result we have two entirely different types of planets. In the one group the solid core predominates in the composition of the building material, and in the other group it almost disappears in proportion to the watery part. In order to define this characteristic difference of the two groups Hoerbiger named the latter "Neptodes" (from Neptune, the lord of the sea), the former "Heliodes" (from Helios, the sun). The structural materials are correspondingly designated as heliotic, if they consist principally of metals and minerals, and neptodic if they consist of water in its various aggregate forms. The vast periods of time which lie between the genesis and the present state of the planets could not change their essential nature, and so we see that today the planets near the sun, the so-called inner planets, are still the specifically heavy ones, while the others, at a greater distance from the sun, are the specifically light ones. A comparison of the specific weights makes this difference apparent:

SPECIFIC WEIGHTS OF THE INNER PLANETS

Mercury	Venus	Earth	Mars	Moon
5.63	5.19	5.56	3.99	3.40

OUTER PLANETS

Jupiter	Saturn	Uranus	Neptune
1.35	0.69	1.37	1.33

We can see that the weight of the outer planets differs but slightly from that of water, while that of the inner planets is considerably greater. If we compare these weights with that of the Earth we see that all planets with the sole exception of Mercury are specifically lighter than the Earth. It is taken for granted that in all of them the composition of the solid parts of the planets is similar to or identical with that of the earth. In spite of that their densities are different, and the earth is denser than the moon, because it is larger, Mercury, denser than the earth because it is nearer the center of gravity, the sun.

If, however, the diameters of the planets are calculated according to their density, as should have been done, smaller values are obtained than those which have been measured; this means that something must have been added to the mass, increasing the diameter to conform to the measured value. This somewhat mysterious addition or substance could be assumed to be wax, amber, or perhaps mixtures of chalk and some specifically lighter material. The question is merely where such material may have come from. But, as we know that the earth is bombarded by cosmic ice bodies and in this manner receives a constant supply of water from cosmic space, it is a natural assumption that the other planets are supplied in the same way, and if we now make a calculation of how much water must exist on them to get the known average weight for the well-known diameter, we get as a result the depth of the ice oceans which exist on these planets. It is certain that the ocean depths of the planets are considerably in excess of that of the earth. But the present state of the earth is not a permanent one and there will come a time when it's whole solid surface will lie deep under the ocean.

The solid core of Mercury lies 3.7, that of Venus 27, that of Mars 270 and that of the Moon 168 miles beneath the surface of the water or ice cover. They are all bodies with solid cores of star material and thick superimposed ice crusts.

CHAPTER II

THE OUTER PLANETS

IN OUR illustration No. 17, the outer planets appear entirely different from the inner planets. Here is shown the actual proportion between core and envelope, and it was not necessary to exaggerate the water envelope. The question arises: how can these planets consist of water, doubtful in face of the assertion which some astronomers maintain that Jupiter is still hot enough to be weakly self-luminous, and that during our time a glowing mass broke out from its interior seen for many years as the famous "Red Spot"? I shall speak of this red spot shortly in the chapter on Jupiter. But first I would ask the counter question: of what material does Jupiter consist, a material which could show at this specific gravity a temperature of 1100 degrees F. for only at such temperature could the red glow become visible?

Suppose we saw a shining white block of metal marked with the weight "5 tons," our first thought would be that it consists of iron. We do not consider zinc or platinum—at first sight they might look like the block—because iron is the most common metal found on earth. It has been well known for many years that the outer planets have nearly the same specific gravity as water, but no one has ever ventured to think that they might consist of water in the form of ice. Still the plausibility is very apparent. Nobody denies the existence of hydrogen in cosmic space, and as we have proved the possibility of the existence of oxygen in great quantities, and at a high temperature, we have the two elements necessary for the production of water. It needs no great strain on the intelligence to concede the ice nature of these celestial bodies, and we are confident that we can remove all doubts as to the correctness of this conclusion.

We now come to a closer examination of the outer planets, but shall consider only Jupiter and Saturn. The others, Uranus, Neptune, and Pluto we shall pass by, as they are at such tremendous distance from the earth that even our largest telescopes can discover nothing of importance on their surfaces which would point to a radical difference in their nature from that of Jupiter or Saturn. Nothing whatever can be seen of Pluto, the latest member of the family, except a luminous point.

JUPITER

Jupiter is the giant planet of the solar system; its diameter is 84,600 miles which makes its size almost eleven times that of the earth, and if we spread the entire area of the earth on the surface of Jupiter it would cover comparatively the same space as did Russia, before the war, on our globe. For the diameter of the solid core we may fix upon 24,000 miles, three times that of the earth. It grew to this size gradually, as the heliotic primeval mass attracted innumerable fragments and meteors from cosmic space.

No matter how hot the core may have been, the steady supply of cold meteors and ice bodies must in time have surrounded it with a solid cold crust on which new masses of ice found a resting place, and

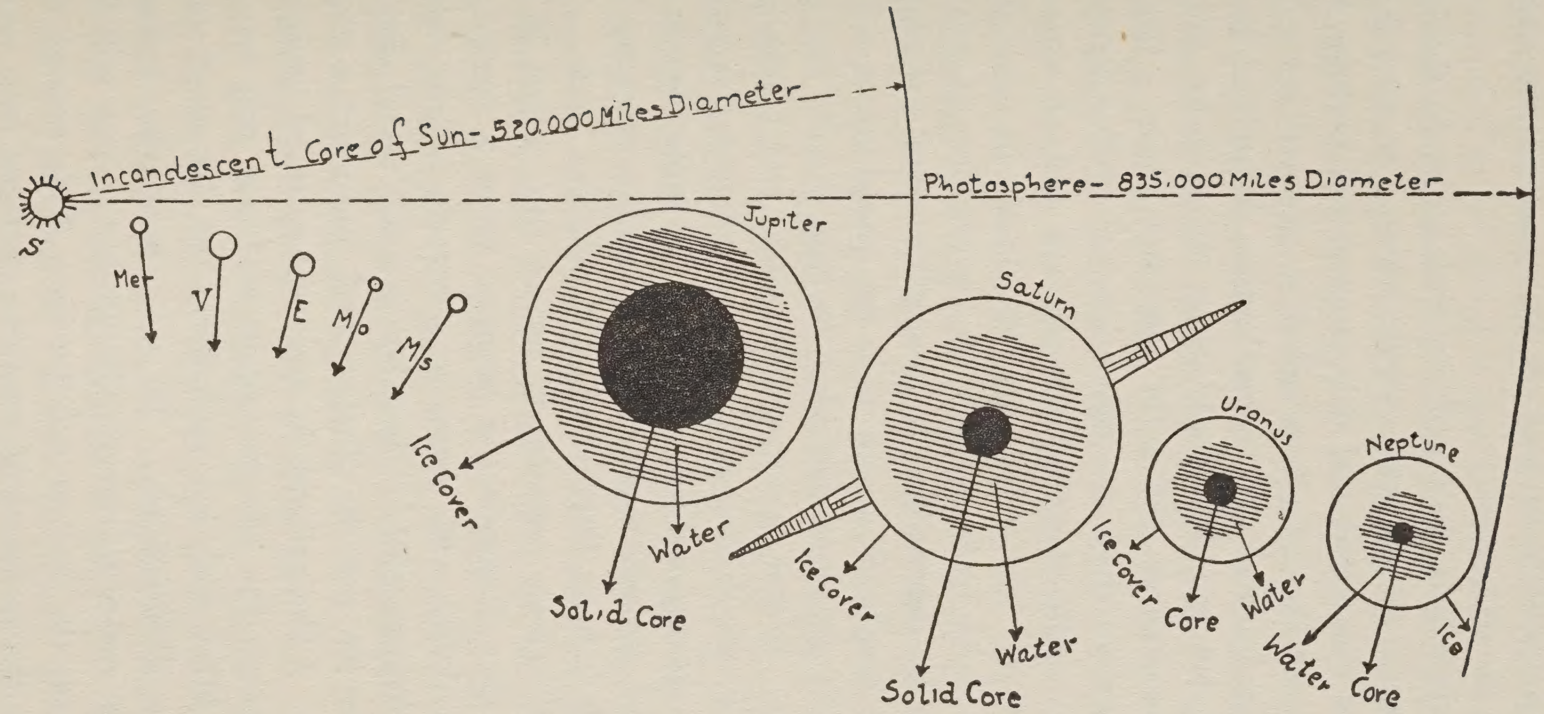
Incandescent Core of Sun- 520.000 Miles Diameter
Photosphere- 835.000 Miles Diameter
S
Me
V
E
M/o
M/s
Jupiter
Ice Cover
Water
Solid Core
Saturn
Ice Cover
Water
Solid Core
Uranus
Ice Cover
Core
Water
Neptune
Water
Core
Ice

FIG. 17. THE SIZE OF THE SUN IN PROPORTION TO THE PLANETS AND THE PROPORTIONAL SIZES OF THE INNER AND OUTER PLANETS.

the planet will have had an ice crust in the earliest time of its existence.

But after this shell had reached a certain thickness the pressure on the lower strata became so strong that heat was generated and this, augmented perhaps by a remnant of inner heat, resulted in the melting of the lowest ice strata. Meteoric bodies, imbedded in the massive ice mantle, would then descend by gravity and thus enlarge the solid core still more. On the water swam a thick, unbroken ice shell with a temperature of cosmic space on the surface and of water in the interior. We must keep this closely in mind since we shall refer to it again in the description of Saturn.

It can be determined by a mathematical calculation at which height of an ice body the lower layers will be warmed by pressure, provided the base is solid and cannot yield. Water is not compressible, and forms such a base. If the thickness of the ice increases, the weight becomes correspondingly heavier; the molecules in the lower and already warmer strata receive pressure and the result is heat, latent or bound pressure heat.

A well-known experiment shows this action in the case of ice: Remove the plunger from a pump and fill the cylinder with water to a certain height, which you let freeze solid. Then lay a small metal disc on top of the ice, put the plunger back and exert a strong pressure. (The cylinder is supposed to stand upright.) Now remove the plunger again and you will see the cylinder filled with ice, as before, but the small metal disc has disappeared. If you heat the cylinder slightly in order to remove the ice block, you will find the disc on the bottom of the ice. This proves that the ice at the moment of pressure changed into water, allowing the coin to sink to the bottom, and reverted to ice when the pressure was removed. Seventy-nine calories had to be added to the ice mass for every cubic centimeter of mass by pressure to get this result; the water never rose over the zero point, for at cessation of the pressure it returned to the ice state.

The same amount of ice which accumulated on the surface of Jupiter must have again been changed into water on the inside of the ice shell by the heat of the resulting pressure, so that the thickness of the ice shell itself remained constant. But the more water-soaked the ball became, the more it became subject to the influence of the gravitational power of the sun, still very considerable on Jupiter, and on account of the eccentric orbit of the planet, to the power of the tides, which latter were still further increased by the moons of this planet. The constant hail of ice bodies, arriving tangentially on Jupiter's equator, greatly increased the rotation of the light body around its axis, and, while the earth makes a rotation in twenty-four hours, Jupiter accomplishes it in nine hours. With its great size a point on the equator will move twenty-seven times as fast as would a corresponding point on the earth. The inner pressure of the flood water against the ice shell, augmented by the centrifugal force of the rotation, brought about the shaping of the plastic ice mantle into a much flattened spheroid.

One could compare this process with the art of the potter who with a pressure of the finger against a lump of clay produces any desired hollow vessel on the potter's wheel. The floods, changing in strength according to the orbital distance from the sun, have caused the ice shell to retain its plasticity and the constant rain of meteors and ice bodies assisted therein. Thus it came about that the ice shell has not as yet sufficient firmness to form a uniformly solid body. In the middle and lower latitudes it is still vulnerable, and this is, as we shall see, the cause of the bands and spots we observe on its surface.

The broad bands, parallel to the equator and studded with darker spots, are not firm or unchanging structures; they change rather frequently in number, shape, and distance from the equator and form an important item in the attempts at explanation. Usually they are compared to the clouds of our atmosphere, but since Jupiter according to our theory, can have no atmosphere, they cannot be clouds, and we explain them otherwise.

The large area of space in the universe which is occupied by our solar system is populated by planets, planetoids, asteroids, meteors, comets, and wandering ice blocks. The latter come in all possible sizes and originate partly from the ring of trans-neptunic planetoids and partly from the Milky Way.

Observations and measurements have established the fact that most planets revolve around the sun in a plane parallel to the equator of Jupiter, and we know the same of the paths of the inner moons of Jupiter, which also rotate around their planet in the plane of its equator. (The so-called outer moons are captured planetoids and have not as yet adjusted their orbit on account of the comparatively short time since their capture.)

We here recognize a law according to which smaller bodies in the course of time must regulate their paths according to the plane of the large body under whose gravitational influence they operate. But smaller bodies cannot resist the influence of gravitation as long as do the larger ones, and will therefore be attracted to the surface of the larger ones before they have time to regulate their rotation to the equatorial plane.

Such small bodies—meteors or ice blocks—revolve around Jupiter, and at their fall they strike the ice-cover of the frozen ocean, which is broken by the impact and allows the water underneath to spurt out through the opening. This outstreaming water darkens the white ice field and these breaks on Jupiter appear to us as spots. The formation into bands now readily explains itself.

On account of the rapid rotation of the sphere of Jupiter the colliding bodies will rarely strike the same spot in the same latitude, but the breaks will appear as lines parallel to the equator. The color and width of these bands is determined by the amount of water which springs from the interior through the impact holes.

And now to the riddle of the famous "Red Spot" which excited the astronomical world about 60 years ago.

In the year 1872 there suddenly appeared on Jupiter a large, not especially remarkable spot. It occurred in a higher latitude than is usual for such markings. After a time it began to color, and after a few years turned to a clear rusty brown. The diameter of its area was calculated at about 16,000 miles, or double that of the earth. In course of time the color faded and became a dirty gray, but the entire area can still be recognized in telescopes on the disc of Jupiter. The explanation most generally accepted was that it was an eruption of the glowing magma from the interior of the planet, and that the spot, as it appeared to us, was the reflection of the glowing mass against the mantle of clouds.

This explanation would be justified only if one conceded the possibility of a liquid fiery core in spite of the insignificant density of the planet and that the glowing magma could penetrate to the surface. Against this we assert that no reflection could penetrate a layer of clouds thousands of miles thick, especially since these clouds are illuminated by bright sunlight which would counteract such glow.

Glacial Cosmogony offers another explanation which is not in contradiction to known facts. It is known that meteors consist of metals and minerals and must at one time have been liquid. Such materials form slag when melting and are oxidized when cooling and melting in water. We can imagine that a fragment of star matter, perhaps iron, attracted small cosmic ice bodies before cooling and dissolved them in the heat of its surface into hydrogen and oxygen and that the free oxygen oxidized a part of the metal. Such a body, if of large dimensions, may enter Jupiter's gravitational field. Before it could adjust its orbit to the plane of the planet's equator, it struck where the ice had attained a considerable thickening, and had not been weakened by other missiles.

At the place of impact the ice shell was dented but not broken through, and the slag and oxide cover had time to spread on the erupting water. We know that furnace slag changes to yellowish clay under the influence of water. Something similar happened here on Jupiter, and the water spread the rust and reddish slag on the field of ice and snow, while the body of the meteor slowly sank into the ice shell. This red spot on the ice surface is seen so plainly in the reflected sunlight because Jupiter has *no strata of clouds* in our sense, which would have hidden it.

The gradual disappearance of the red color is easily explained by the exhaustion of the oxidized material and its sinking into the newly formed ice. It is certain also that in these latitudes a sufficient quantity of ice bodies will fall to restore to the spot its former white color. The phenomenon of the red spot is thus merely another special case of the impact of a large meteoric body on the surface of Jupiter.

These are purely mechanical processes, the fall of meteors, the breaking of the ice shell and emergence of the water from the interior, which have nothing mysterious or physically impossible about them. I have given so much space to the explanation of this phenomenon in order to get a sure foundation for the unveiling of the greatest mystery in the heavens, the origin and nature of the ring of Saturn.

Saturn and Its Ring

The fantasy of authors and poets has often flown far ahead of their time and has predicted events which later actually came to pass. Astronomy has in its annals such a fantastical prediction when Voltaire, around 1760, prophesied that somebody would discover that Mars is accompanied by two moons. It is almost certain that Voltaire got this idea from Swift's "Gulliver's Travels," but it seems strange that he would dare to treat a work of fiction as scientific material. But a hundred years later both moons were found, appearing as insignificant dots in the neighbourhood of Mars, although prominent astronomers had always decidedly opposed the possibility of such a thing. But not even the wildest fantasy, roaming in the universe, could ever have produced such a strange phenomenon as Saturn and its ring. A star floating free within a large, flat, independent ring, a ring lighter than the star itself and rotating with it around the same axis. Nobody would ever have thought of such a thing, for there is nothing in our experience to equal it. It is even impossible to make a working model of it!

The telescope revealed this miracle of celestial mechanics to the human eye and for a long time its possibility was denied. Huygens was the first to recognize the free floating ring, and he left his discovery, according to the custom of his time, in an anagram, so that he could always claim priority, if the discovery should be announced from another source.

It is impossible to convey an idea of the wonderful spectacle which the telescope unveils. One must have seen it, to believe that such a thing exists in the heavens. A picture is a poor substitute. We see the sphere, recognize the inner and outer borders of the ring, see also the dark space of heaven between sphere and ring, can therefore not doubt that the ring floats freely around the ball.

To get an idea of the proportionate dimensions let us contemplate the following figures: The diameter of the sphere measured at the equator is 73,800 miles, measured between the poles 66,000 miles; it is therefore about ten times as large as the diameter of the earth. The width of the ring is 38,000 miles, its outer diameter 171,000 miles. These figures are approximate. An exact measurement is impossible, because the innermost part of the ring is but weakly illuminated and difficult to measure. The luminous area of the ring is divided in several dark concentric rings; some observers say they have seen five. The best known are those called after their discoverers, the Cassini and Enke partitions.

We do not know the thoughts of those who first recognized this formation as a closed ring and how they explained its origin. It is almost certain that it was believed that the ring was liquid or perhaps of a doughy material. But it seemed equally certain that it could not possibly be a solid structure. The conditions under which such a structure could originate were, of course, unknown until Laplace published his theory, and the ring of Saturn was for a long time its best prop. It made no difference of what material the ring was made, it was sufficient to know that it consisted of the mass of Saturn, torn by centrifugal force from its equator, while the rest of the sphere contracted. But the luminous surface is parted in two or three divisions by dark circles of various widths and it was believed that there were several rings until calculations showed that solid rings at such short distances from one another could not revolve without brushing against each other and thus being destroyed. Calculation showed that the inner border of the innermost ring must rotate around Saturn in 7.5 hours while the outermost would need more than thirteen hours to make a single rotation, while Saturn itself rotates around its axis in a little more than ten hours. Therefore the rings could not be rigid. The end-result of many difficult and complicated calculations is the Hirn-Maxwell theory that the rings are structures of loose meteors, infinitely small moons and cosmic dust, gathered from out of cosmic space and capable only of such motions as would not endanger the stability of the entire structure.

It has even been determined by mathematical calculation that, taking into account all elements of disturbance by the large moons of Saturn, the small moons and meteors of the ring must arrange themselves in such a manner that the so-called partitions are formed.

If this theory were correct the system of Saturn would present the following picture, reducing the measurements to small proportions: A ring, three feet in diameter, floats around a sphere about seventeen inches in diameter. This ring is of the very thinnest texture, much thinner than the thinnest tissue paper produced, and consists of fine particles of dust in concentric rings. Is such a structure technically possible?

Far be it from me to belittle accomplishments which are the results of the labor of mathematical geniuses, but as they were made to prove an unproved theory, we have the right to doubt them. Another factor must be taken into consideration: They are supposed to be individual rings, therefore the inner ones must rotate with greater angular velocity than the outer ones. Direct observation, difficult at best, has not shown any such phenomenon, because at the distance of Saturn from the earth, 3,000 times as far as the moon, it has not been possible to detect details on the rings, whereby the speed of rotation may have been calculated.

But the Doppler Method, which has successfully determined the motion of stars, is said to have shown a divergence between certain lines of the spectrum of the outer and inner rings, proving that the inner ring border rotates faster than the outer one. But even if we accept this as correct, and the process is a very difficult one, there is still another factor to be considered. Saturn has, like all other planets, a mantle of hydrogen which must be denser in the lower latitudes of the sphere than at the outer ring border, where the density might approach zero. The ray of the sun furnishing the spectrogram must twice pass through this mantle, once on its way to the ring and then again on its way to the earth. Every light ray is broken according to the density of the material it traverses, and it becomes apparent that this divergence will be different from a part of the ring near the sphere than from one coming from the border. This makes the inner ring border, in this respect, not only different from the outer one, but also the inner western ring-edge quite different from the inner eastern one. We are convinced that the Doppler effect, if correct, is due to this circumstance.

The main difficulty in solving the question as to the firmness of the rings was due to an apparent lack of suitable material of which the rings might consist. Ice as such had never been acknowledged before Hoerbiger's work.

But we shall see that such a ring may consist of ice and we therefore quote Hoerbiger's sentence: *Saturn's ring is a rigid structure, uniformly composed of ice and balanced in such a way that it supports itself. In its inner composition it is as solid as only ice at the temperature of cosmic space can be, and it rotates around Saturn as one body with the same velocity of the outer and inner borders and in about the same time as this planet rotates about its own axis.*

Saturn originated by the same process as we observed in the case of Jupiter and the other outer planets. We have to think of it as a huge ball, covered by a thick mantle of ice, hiding a small heliotic core of meteoric material. This mantle of ice may have been much stronger than Jupiter's for several reasons. First, because at the greater distance from the sun, the heat supply from that source is smaller. Second, because, again on account of the farther distance, the flood phenomena will be much weaker, and third, because of the smaller gravitational attraction on its surface, which on account of its smaller mass is less than on Jupiter, less heat by pressure is produced.

The ice mantle was therefore not so much disturbed as in the case of the larger planet, and after it had grown to a certain thickness could not be pierced any more by meteoric bodies smashing into it, as was the case on Jupiter.

According to the Glacial Cosmogony one of the most important laws of the universe is the law of the shrinkage of planetary orbits in proportion to the mass, diameter and velocity of the planets. If we look at the orbits of the planets we will see a broad hiatus between the orbits of Saturn and Uranus. Here Hoerbiger divines another planet, which he calls Intra-Uranus. This planet, a little smaller than Uranus, but, like it, an ice-covered ball, gradually approached Saturn, was captured and made a satellite. This moon of Saturn was doomed to destruction in course of time, similarly as was our own tertiary moon.

This happened at the fatal distance of 3½ Saturn radii, and the gravitational forces of Saturn rent the ovate satellite in two parts; each spread out into a shallow ice ring by its inherent centrifugal force. Thus we had two widely separated rings, an inner zenith ring and an outer nadir ring, which revolved around Saturn and contracted under the gravitational force of the planet. Later the two rings again united and the place of union is the so-called "Cassini Partition." Hoerbiger, in an exhaustive treatise, demonstrates the mechanical processes, but it is too technical for the general reader. It will suffice to say here, that according to his calculations Saturn's ring consists of rigid ice. At its strongest part it is more than 2,500 miles thick which technically prevents a collapse. The alleged view of the Saturn sphere through the Cassini Partition he explains with the theory that this is a reflex of the upper hemisphere in the smooth, shining ice of the ring.

We cannot leave the subject of Saturn without mentioning a second remarkable feature of this planet distinguishing it from the other outer planets, namely its small specific gravity.

According to the latest measurements and calculations Saturn has a specific gravity of only 0.69. This is considerably less than the specific gravity of water and makes the planet an exception to the general rule, which according to their specific gravities is slightly above that of water. The ball of the planet would therefore float in water. We can safely assume that the structural composition of Jupiter, Uranus, and Neptune is identical, but in the case of Saturn we cannot settle upon any material of which it might consist. Hoerbiger finds the cause in the fact that while Saturn, like the other planets, has a mantle of hydrogen it does not surround the planet's orb to the same height as is the case on the others. The ring draws it to the equatorial latitudes by gravitational force. On account of the refractional effect of this thick covering of hydrogen the equatorial diameter of Saturn is probably calculated as larger than it really is, which is corroborated by the observation that the polar flattening is greater than that of Jupiter, although Jupiter has a much faster rotation. The ring will account for part of this phenomenon but not for all of it. Therefore, reasons Hoerbiger, the low specific gravity of Saturn is no proof against the assumption of its icy nature, because its density of 0.69 is calculated from much too large a volume.

Another simple experiment will make clear this apparent enlargement of a body when seen through a denser medium. If you hold a pencil or similar object in an empty water glass, you will notice no change in diameter. But if you fill the glass with water, the part of the pencil in the water will appear decidedly thicker than the free part. For the same reason appear the sun and the moon when near the horizon larger than when overhead, and the constellations seem to expand when low in the sky, because the light emanating from them has to traverse a longer distance through dense layers of the atmosphere.

The ball of Saturn will look somewhat larger at the equator, if you consider the denser accumulation of hydrogen there, than elsewhere on the planet, and that leads to an error in the calculation of the real diameter and a faulty determination of the mass.

CHAPTER III

ABOUT THE INNER PLANETS

IN THE case of the origin of the inner planets, Mercury, Venus, Earth, and Mars and also the moon, before it was captured by the earth, the Kant-Laplace hypothesis and the Glacial Cosmogony travel together for a certain distance, once the glowing, whirling chaos has been accounted for.

Incandescent star fragments whirled in the zone of the chaos after the explosion, near the central mass, and gradually condensed into balls by attracting all smaller bodies by force of gravitation. For long periods they circled around the sun as miniature suns, until their crusts began to cool and harden.

Now the ways of the two theories separate. Kant and his followers simply leave the spheres to their cooling process, but Hoerbiger attributes the development of their surfaces to the supply of cosmic ice, which comes from the swarms of ice blocks, travelling from the Milky Way on their way to the sun, and from the sun itself in the form of ice dust, blown out by constant explosions. The difference in the surface formations of the inner planets from that of the outer planets is due to the conflict of the cosmic ice with the glowing nature of the cores. This conflict of opposing primeval matter has given to every planet its peculiar face. In order to understand this, we must learn something more about the ice in our solar system.

There were four possibilities by which a planet might be supplied with cosmic ice, after the solar system regulated itself. The capture of ice blocks on their direct way from the Milky Way to the sun, the capture of ice blocks after they had failed to reach the sun, the absorption of the ice dust from the corona rays, and finally, the occasional capture of an ice asteroid from the swarm circling between Jupiter and Mars. The capture of ice blocks on their direct way to the sun can be accomplished by the inner planets, only when they traverse the ice zone in course of their revolution. For the earth that would be in the beginning of August and the middle of November. The nearer a planet is to the sun, the greater is the opportunity proportionally for such a capture. It has been stated that Mars would not receive quite half as much ice as the earth, while Mercury receives seven times as much.

We have already learned of the depths of the planetary oceans on page 228, and here we have the table of values according to calculation:

	MARS	EARTH	MOON	VENUS	MERCURY	
Diameter:	4206	7908	2153	7548	2930	miles.
Ocean Depth:	267	1.6	165	31	3.5	miles.

The earth has an exceptional position among the inner planets, which I shall touch upon a little later. The solid cores of our neighbouring bodies, Mars and Moon, lie miles deep below an ice ocean. The moon has been treated in a previous chapter and Mars is the only planet with which I have to deal at length, as the other two, Venus and Mercury, present so few recognizable features to the observer that only very uncertain deductions can be made.

MERCURY

I take the description of Mercury, the little that is known of it, from Schiaparelli's observation. It is a rather dark ball without atmosphere, not unlike the moon, and until recently was believed to have turned always the same side toward the sun. Later observers contradict this and give Mercury a rotation around its axis in about twenty-four hours, and a revolution around the sun in eighty-eight days.

On its surface can be seen in large telescopes some rather broad, dark-gray bands, running longitudinal, but around the poles are lateral dark bands in which the meridional ones end. There are no polar caps, like Mars shows.

Millions of years of bathing in the ice-dust blast from the sun cooled and solidified Mercury's crust, which finally resulted in the formation of oceans and continents, as on earth. There may have been a time, when Mercury resembled the earth, except that it never had as dense an atmosphere.

But Mercury's mineral crust was soon soaked in water like a sponge, and the supply of interior heat lessened gradually. Consequently the oceans rose until all continents and mountain ranges were submerged and a shoreless sea covered the entire surface. As long as land still rose above the waters, a development of strong heat at noon was possible, but this changed when the waters prevented the escape of gases from the glowing core and the existing atmosphere escaped into space. The atmospheric pressure sank to almost zero and an ice-mantle laid itself around the planet.

This cannot melt, even in the noon heat of the sun, for thermo-technical reasons easily understood by the physicist. The ice-mantle probably originated at a time when Mercury's rotation around its own axis had slowed down considerably and started on the night-side of the planet. Slowly it extended to the day-side, and for want of a protecting air cover the temperature sank over the shoreless ocean after sunset until it almost reached the absolute zero of space.

The ice crust froze to such thickness during the night, that the heat from the sun during the day could not entirely melt it. There remained a crust of ice from day to day, until the entire ball of Mercury was crusted over, as it is today, according to Hoerbiger.

The dark stripes which are observed on Mercury are explained as breaks in the crust, for the planet circles around the sun in a very eccentric orbit and is therefore subjected to immense tidal floods. It is just as if you drew an egg lengthwise (made it more pointed) and pressed it together again. These tortions caused by the power of the near sun must lead to frequent breaks of the crust, when the liquid must come to the surface and must wet from below the ice dust blown from the sun.

Something similar happens on a frozen pond, when the ice is too heavily loaded with skaters and breaks. Along the rupture, water will rise and spread on the ice, powdered by the skates, like ink on a blotter. In this way originate dark bands, which enlarge at their intersections to round dark spots (lakes). When at last the balance is restored again, the fine breaks freeze and the dark ice is powdered over by the ice dust from the sun and "bleached" so that the bands disappear until a new break tears open the old wounds or makes new ones.

Calculations have shown that the most vulnerable points are + 50 and — 50 degrees of Mercurian latitude, so that there longitundinal breaks will be frequent, while the polar regions are protected by a ring-shaped girdle at about 55–60°. Thus appears really the picture which Schiaparelli depicts on his map of Mercury.

The time which the comparatively small sphere of Mercury required to reach its present state was much shorter than for instance in the case of Venus, and whilst there may have been a possibility for the evolution of the lower forms of life, it was too short for the evolution of the higher animals or man.

VENUS

Venus is evidently also a sphere which is covered with a solid crust of ice. Its orbit is, contrary to that of Mercury, almost a circle and therefore hardly affected by the tidal influence of the sun. Breaks of the crust and spurting forth of water are rare, but Lowell claims to have observed Mars-like lines which were visible only a short time. On this crust lies the pulverized snow from the corona rays, piled up in millenniums of time. A certain vaporization takes place on the noon-side, and wraps the planet in a veil of icy mist, so that its surface can be seen but dimly.

These thin ice-mists creep from the noon-point, where the supply of ice dust is densest, towards the shadow-side and would form a comet's tail, if Venus were a small planet. But the gravitational force of Venus holds them closely to the surface and deposits them on the night-side. Here collects the ice-powder in great masses on the frozen ice and causes by its weight a melting of the ice deep below. The same physical process we observed on the planet Jupiter.

This restores the balance and prevents all ice being deposited on the night-side.

A ring of light is sometimes observed around Venus, when the planet passes the edge of the sun during a transit, but this is not due to a gaseous envelope, but rather to the electric phenomena of the ice dust.

Lately it has been claimed that Venus also rotates around its axis in twenty-four hours, and that is probably the cause for the observation that even on the night-side comparatively high temperatures have been found.

On account of the greater size of Venus the time required for the cooling process was longer than that of Mercury. But we have no way of knowing whether life ever existed on this planet, before the ice buried it under its masses. The Glacial Cosmogony teaches, contrary to the hypothesis of Laplace, that Venus is not a youthful earth, where prehistoric, fantastic animals and plants hold sway, but rather a prematurely aged planet, far ahead of our earth in development. It presents a state of existence at which the earth is fated to arrive sometime.

It is certain that neither Venus nor Mercury are inhabited today—we are alone in the entire solar system. And if we turn our mind on the vast universe, as far as it is visible to us, there are very few points where we can expect life to exist. There is the ring nebula in the constellation Lyra, where a Milky Way similar to ours may provide the necessary conditions for the development of life; or the Andromeda nebula, surely a more youthful island-universe than ours, which may in future be the bearer of life.

These are so far the only two stellar objects known to us where life may be expected or hoped for. But they are about 1000 light years away from us and a ghastly, inconceivable space separates us. We are, indeed, lonely wanderers in the shoreless ocean of time.

Mars

Any star map, such as is frequently published in some magazines, will give you the position of the planet Mars in the sky. If you have the approximate position for the month of your observation, you cannot possibly miss it. It shines brightly with a baneful, mysterious red light. No wonder that it bears the name of the Roman god of War; its reddish glow associates it in the human mind with blood and fire and evil.

It is the most fascinating of the planets and, as we know, our next door neighbour in the solar system, being at times only 35 million miles distant from the earth. For a long time it presented few points of interest to the astronomers, although certain data about it were collected. It revolves around the sun a few minutes under 687 days and rotates around its axis with almost the same speed as our earth, viz., 24 hours, 37 minutes and 22.73 seconds. Its equatorial diameter is about 4200 miles, its polar about 70 less. Its mass is about one-eighth that of the earth, so that things are much lighter on Mars than on the earth.

Looked at through a powerful telescope the fiery red glow is not as uniform as viewed by the naked eye, but confined to certain areas, which therefore were believed to be continents with a reddish soil. Contrasted with these areas, others appear greenish and were considered to be seas.

Around the poles are brilliant white caps, which were supposed to be ice and snow, as they, according to Herschel, "disappear when they have been long exposed to the sun, and are greatest when just emerging from the long night of their polar winter."

This was in short the sum and substance of the knowledge about Mars, when suddenly the world was startled by the announcement of a tremendous discovery. The Italian astronomer Schiaparelli announced in 1877 that the favorable position of Mars in that year, together with the clear skies of Italy, had enabled him to construct a wonderful map of Mars which gave surprising details of its surface.

Immediately Mars became the center of astronomical observations and even the newspapers were full of the mysterious canals which had been seen on Mars, although Schiaparelli had only spoken of "dark lines."

The astronomical world was divided in its opinion. If the discovery had been made by an amateur astronomer, the matter would probably have been relegated into the realms of fable, but as Schiaparelli had announced it, it could not be brushed aside with a condescending smile.

Some astronomers corroborated Schiaparelli's discovery, but many used their brains and knowledge merely to prove the impossibility of such a thing. The same procedure, as is now used against Hanns Hoerbiger and his Glacial Cosmogony.

At the present time there is little doubt about the existence of the canals, and many books of fiction deal with the civilization of Mars, where engineers, far in advance of our engineers, have constructed these immense works, in order to distribute and conserve the water on the aging and drying planet.

Attempts were even made to get into communication with the inhabitants of Mars, and one often reads in the newspapers startling headlines about signals having been received by light and radio from Mars. All these fantastical speculations have subsided again and Mars is silent.

All sister planets of the Earth are dead, ice-covered worlds. On our planet alone has the scarcity of water preserved the interior heat, making a combination of oxygen and nitrogen still possible. In other words an atmosphere of air still surrounds it. All other planets carry a mantle of hydrogen only, more or less dense, according to size and mass. Hoerbiger estimates, on the basis of calculations, that the moon has hardly a trace of atmosphere and that Mars has an atmosphere about 1/140 of the density of that of our earth. There can be neither storms nor clouds on either.

The absence of a heat-conserving mantle and the resulting lack of atmospheric pressure makes it certain that Mars must be a body completely covered with ice. A shoreless frozen ocean surrounds it. It is the mantle of air which protects all life against cold and Mars has but a very thin covering. In addition, it is much farther from the sun than the earth and receives only about one half the amount of radiation. Its axis is also much more inclined and the difference between summer and winter is much greater than it is with us.

The possibility of life on Mars depends on the temperature, for life, such as we know it on earth, cannot exist below a certain temperature. Until a short time ago there was no certain way of determining this and one had to depend on suppositions and calculations. Professor Milankovitsch made an examination of this problem and found an average temperature for the entire planet of zero Fahrenheit, whilst our earth has one of + 59 degrees Fahrenheit.

But direct measurements of the Mars temperature made in 1922 and 1924 give a different result, viz., — 13 degrees for the average, and for regions on the Mars equator about + 45 degrees Fahrenheit.

It was also observed that the darkest fields showed higher temperatures than the red or white ones, which contradicts the idea that these fields were oceans. Most astronomers believe now that Mars has a perfectly rigid surface; Scheiner thought of a glacial period on Mars at the present time. It is, of course, hard to understand how such a period after it has once begun, will ever stop again.

The bright polar caps are now supposed to be caused by the cooling of the Martian atmosphere and not to be snow or ice fields.

Constantly, for millions of years, Mars caught the ice planetoids from the zone of asteroids. Its two minute moons, Phobos and Deimos, were such asteroids, and the immense supply of cosmic ice brought about the great depth of the Mars ocean.

But what about the famous, mysterious canals? What can possibly explain these gigantic structures? Every map of Mars shows plainly light and dark areas on its surface. The dark ones, mostly situated in the higher latitudes, are usually called seas and the lighter ones, in the equatorial regions, continents. These are covered with a net-work of criss-cross lines, which seem very fine, but are in reality many miles wide. At the intersections of these lines there are large dark areas. These lines are thought to be canals filled with water.

The adherents of this supposition claim that these perfectly straight canals were made by artificial means and form an immense Martian engineering system, which conveys the molten water from the poles into the lower latitudes. These canals were used partly for irrigation of the fields and partly for transportation purposes. Such a gigantic work, however, presupposes a great intelligence, long technical experience and perfected mechanical means on the side of the Martian population, so that we have on this red planet a race of supermen, fighting their last stand for existence in an aging world.

Many ingenious and sometimes amusing theories were brought forth. Mars, being much older than the earth, was much farther advanced in development; the mountains had been levelled by the action of water and other causes, and on the broad levels of the planet the construction of so many thousands of miles of canals offer no such difficulty as on earth.

It could also be that the water was carried between high levees. In that case it would not make the slightest difference whether they were fifty feet or fifty miles in width. The dark intersection points were, of course, reservoirs, or perhaps already existing lakes.

These canals were visible from the earth only when they were filled with water, which explains their disappearance from time to time. This could be followed by observation of the poles, where the receding of the ice caps was followed by the appearance of canals. The canals, however, do not appear in the same places in succeeding years, a rather suspicious circumstance, —but easily explained by the necessities of Martian agriculture and the varying distribution of the water in consequence.

A truly wonderful picture of Martian life! No wonder that some enthusiastic individuals, spurred on by "popularized scientific" articles in the newspapers, tried to get into communication with these Martian supermen. Incited by the descriptions of Flammarion, the French astronomer, a lady offered a prize of 100,000 francs for the first man to accomplish this. Nobody considered that, in case communication were really established, the signals from either planet would not be understood on the other one.

When a particularly bright spot appeared on the surface of Mars, it was immediately taken for granted that the Martians made efforts to signal to the earth. Most people received the impression that these supposed canals, and the flow of water in them, could be easily seen in the telescopes, but that is, unfortunately for the theory, not at all the case. Only in very large instruments, under specially favorable conditions, can traces of very fine lines be sometimes noticed.

There is a tendency to look at conditions on Mars, as if they were analogous to those on earth, but this is a great error. If an observer sees reddish tints in a plain, which before had been white, it is no reason to conclude that a Martian Krakatoa volcano had been in eruption, strewing its ashes far and wide, and thus many deductions made according to terrestrial conditions are surely erroneous. All sorts of calculations and measurements were made with the single intention to prove the possibility of life on Mars, in order to invent creatures which might have built the canals.

Many ideas will have to be discarded to arrive at the conclusion of the Glacial Cosmogony.

Like all other planets Mars was originally a glowing mass of star material on which cosmic ice bodies landed. They surrounded it with a cloud of steam, which condensed to water as the cooling process proceeded. This water froze at cosmic temperature, and when the ice grew to such depths as to cover the entire planet, the crust formed a hollow sphere, swimming freely on the water, a shoreless ocean of ice.

Again we have the ceaseless play of the tides under the influence of the sun, in addition to the pressure from the interior through the constantly growing depth of the ocean. The ice shell was torn into floes. The bands of water between the floes froze again but never reached the thickness and strength of the older crust. Another factor entered. The eccentric orbit of Mars which enabled it to capture almost every asteroid which came near it, caused also the breakage of the shell to be repeated again and again. Whenever the planet is near the sun, the power of the flood is much stronger than when it is at a farther distance.

The power of gravitation of the sun operates with greater force at close proximity than at a distance, and the low gravity of Mars, a result of its small size, augments the effect on the ice shell. Water will emerge through all these weak cracks, which weakens them still more, while the old ice remained unchanged and became thicker toward the bottom. Thus originated "old ice" floes and "new ice" fissures. On earth also old, thick ice, perhaps covered with snow, looks whiter than thin new ice, through which the water seems to show. Millions of years ago the planet may thus have shown small dark stripes, which were the "new ice" fissures.

We enter an interplanetary ship of the future and land on the surface of Mars, when it is nearest to the sun. Standing on the ice shell we notice under our feet an uneasy motion. The water under the ice follows the pull of the sun power and tries to rise in a flood, but is prevented by the ice mantle.

Seeking to overcome this resistance, the water presses heavily from below and bursts through at the point of least resistance. That is where the new ice fissures join the old ice floes. The outcoming water seeks its way according to position of the rims at the breaking point.

If the break is on a level area, a broad band is formed with indistinct borders; if the break occurs in an area with one side of the fissure higher than the other we get a sharp border on one side only, the other being indistinct. In this way we can account for all forms of border-formations.

By the separating of "old ice" floes such a broad arc of water and "new ice" may be formed that breaks may occur on both sides and we have the phenomenon of double canals. All canals, in short, are the result of tidal floods from the interior of the planet and the dark areas around the intersections are nothing but newly frozen water, due to tidal action.

But we must also speak of the reddish color, the sinister glow which emanates from Mars in the night sky. Many will think that there is no possibility of explaining this phenomenon, when Mars is supposed to be covered with ice and snow, and neither can possibly be red. But it is a well-known fact that on earth deep sea dredging brings to light a reddish sediment from the sea bottom, a sediment to be found there in great masses. It is believed to be cosmic, meteoric dust which rains down upon the earth incessantly.

Such cosmic dust was found by Nordenskioeld on the ice in the interior of Greenland, but it is found on various other places on earth, as we learned in the chapter on sun spots. Chemical analysis shows it to be, for the greatest part, oxide of iron, but there are also traces of oxide of nickel and other metals and minerals. Its spreading on the fields of snow colors the whitish appearing old ice floe with a reddish tint and the change from the red color into white, which has been observed occasionally, may be attributed to the formation of rime frost, which occurs when water under the lack of atmospheric pressure vaporizes and precipitates itself in the form of rime.

The reddish color is therefore no proof of the existence of land on the surface of Mars. The objection may be made, however, that in such a case Venus and Mercury should also show a reddish color. But on these planets the ice dust blast from the sun overcomes in quantity by far the cosmic dust supply and quickly overlays any reddish deposit.

Those who are interested in Mars and wish to go deeper into these problems will find a great deal of material in Hanns Fischer's excellent book in German, "Der Mars, ein uferloser Eisozean."

CHAPTER IV

The Earth as the Star of Life

We have now reached the end of our journey, our long journey through the vast reaches of space and time. We watched the development of our solar world from cosmic bomb to orderly system. We read in the book of nature the cosmic events and made our deductions as to their influence on the life of us mortals. Reluctantly we admitted that our neighbouring stars in the solar system are dead worlds, void of life, dead and frozen and that we are lonely wanderers, accompanying the sun on its lonely journey through space.

We might now ask the question: Why has the earth, of all planets, an exceptional position enabling it to develop organic life? Why does the earth enjoy this unique distinction? Here, at the end of our journey, we shall take up the case of the earth.

We take it for granted that the core of the earth, like that of the other planets, is star material from the giant mother star. In the beginning the earth moved in the cloud of steam and ice dust which surrounded the growing sun. It attracted a number of ice bodies, which, after the cooling of the glowing mass, became water and formed various chemical combinations with its constituents. When the supply of ice in this zone became exhausted, the earth maintained a position where it was impossible to capture a large supply of the ice bodies travelling to the sun. Mighty Jupiter circled far beyond and caught a great amount of sun-bound ice; those which passed Jupiter were already under the attraction of the sun, and all except the slowest pass the earth by. But between Jupiter and Earth revolves Mars and it serves as a protector of the earth and catches all planetoids which have escaped the attraction of Jupiter. Its strongly eccentric orbit is a guard against approaching ice planetoids.

Seldom one escapes, as did Eros; the majority are caught as moons and in course of time devoured. This explains the immense quantity of water on Mars, a quantity that would constantly increase, while the water on the surface of the earth would be absorbed or disappear, by chemical combinations and by loss of hydrogen into cosmic space, were it not for the fact that a constant bath of ice dust from the sun spots replenishes it.

But not merely the favorable distribution of water and land makes our planet inhabitable, but also the existence of an atmosphere, which maintains the balance of temperature and contains all the elements needed by breathing life. The air envelope protects the earth and all its living creatures against the strong radiation of the sun and against the death-dealing cold of cosmic space. It serves as a cushion against cosmic intruders, shooting stars, meteors, or fire balls, which would be very destructive if they struck the surface of the earth with full force.

This protection however, is effective only against smaller bodies. Should a planetoid or even a moon approach the earth, the death of most living beings is fated to occur, and only from the survivors can life be recruited again.

The next cosmic catastrophe which threatens the earth is the approach and disintegration of our moon. Slowly, very slowly, it is approaching the earth in its spiral orbit and humanity will again pass through the various terrible phases which it survived in the case of the tertiary moon.

But our present moon is a much larger body than the tertiary moon was, and the catastrophe of its mergence with the mass of the earth will bring about a far more destructive cataclysm than any preceding one.

A calculation has been made by Major General Haenichen in "Zeitschrift fuer Welteislehre" No. 4, 1934, as to how high the earth will be covered with the débris of the present moon, after its fall upon the earth. The result is not very encouraging as to the chances of life surviving on our planet after the cataclysm.

Supposing that the ice mantle of the moon has a thickness of 168 miles, the mineral layer underneath it a thickness of about 400 miles and the metal core a radius of 500 miles. The ice alone, converted into water would cover the earth to a height of over 10 miles; it would at first deepen the girdle flood, still racing around the equator, and then spread over the earth in the great flood which would follow. The mineral shell, descending next, heaps another 13.6 miles of débris on the earth and the metal core adds its quota, bringing the entire addition to the mass of the earth to a height of about twenty-five miles.

The highest mountain on earth, Mt. Everest, is only slightly over 29,000 feet high or less than six miles and the moon wreckage would cover our beautiful earth to a height of twenty-five miles. I leave it to the imagination of the reader to predict the fate of life on earth, but am quite sure that neither our generation nor a good many following need worry about this and may safely apply themselves to the many problems confronting them now.

Still circles Luna around the ball of the earth, still far away in distant space, but inexorable is her approach to our planet. Millions of years will pass before the cosmic clock will strike the portentous hour. Slowly the earth will again have been covered to a great extent by the creeping tongues of ice, immense floods will rage around the ball, storms and hail and flaming mountains will descend on the defenseless lands and then another moonless period will come to the children of man on a new earth.

An immeasurable time will pass until the next catastrophe, probably, a golden age, until a new satellite approaches—the planet Mars.

Known on earth in legends and sagas as the star of war and destruction, it will bring to the earth the cruel fate of the annihilation of all life. The union of Mars and Earth means the hour of death for humanity, for man the cosmic clock has run down. The last swing of its pendulum will be buried in the waters which will cover the highest peaks of our mountains. This is the end of life.

The cooling core of the earth will no longer breathe forth gases to create an atmosphere, and hydrogen gas only will surround the dying star; cosmic cold will descend, the water will freeze and a shoreless ocean of ice will cover the entire earth.

Dead and cold, encrusted with ice, the earth will keep on its lonely spiral journey to the sun, and all wisdom and beauty which has been created in eons of time will be lost forevermore. The earth will then find its last resting place in the bosom of the fiery sun, where Venus and Mercury found it long before. How and why life should have originated for such a purpose, is a question that transcends the scope of this book. We are here concerned with physical matters only.

The fate of the outer planets will be a similar one. The four large outer planets will come much nearer to the sun. Great changes will come to pass. The wonderful Saturn will become the moon of Jupiter and lose its ring in the process of capture. Finally Saturn itself will dissolve into a mighty ring around Jupiter.

At last Jupiter will receive its two remaining neighbours, Uranus and Neptune, and circle as a lonely grand moon around the blazing sun.

The sun also appears to us in a new light—dispensing ice in addition to light and heat. It will keep on radiating energy into space for untold eons, being itself fed by ice from the Milky Way and by incessant showers of meteors. An enormous increase in temperature will occur when Jupiter, having approached in solitary grandeur as the last of the planets, will rain an immense mass of meteors on its surface.

Then it will continue its course through space, until perchance it enters the gravitational field of a giant star. For eons again it will revolve around the latter, to disappear at last in the lap of the mother star, or perhaps to become another cosmic bomb to complete the eternal cosmic cycle.

And here we are again at the story of giant bomb and of cosmic explosion. An explosion of such magnitude that, in addition to our solar system, millions of dwarf stars were torn from the mother star to form the sidereal galaxy.

The eternal cosmic cycle! What matters the short life of the individual, what that of a nation, what that of all humanity? A mere episode in the turn of the cosmic wheel. Sir Edwin Arnold expresses it in his "Light of Asia":

"Only, while turns this wheel invisible,
   No pause, no peace, no staying place can be;
Who mounts will fall, who falls may mount; the spokes
   Go round unceasingly."

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Georg, Verschollene Kulturen.
Giehm, Welterkenntnis und Weltenbau.
Hinzpeter, Urwissen von Kosmos und Erde.
Hinzpeter, Die Bildung der Hochgebirge.
Valier, Der Sterne Bahn und Wesen.
Valier, Anleitung zum Lesen kosmotechnischer Zeichnungen.
Voigt, Eis ein Weltenbaustoff.
Voigt, Die Welteislehre und ich.
Voigt, Welteislehre und Wissenchaft.
Waitz, Die kosmischen Ursachen des Wetters.

EXPLANATION OF FREQUENTLY USED ASTRONOMICAL TERMS

Acceleration—Dimunition of the period of Revolution.

Apex—The point toward which a heavenly body, usually the sun, is moving.

Aphelion—The point of a planet's orbit which is farthest from the sun.

Bolide—A meteoric ice body.

Coma—Luminous cloud around a comet's head.

Corona—Light around the sun, visible at Total Eclipses.

Ecliptic—The apparent path of the sun through the sky.

Galaxy—The Milky Way.

Geoid—The figure of the earth.

Heliodes—Planets consisting mainly of fixed star matter.

Magma—The molten interior of the earth.

Nebula—A cloudlike mass of gaseous matter.

Neptodes—Planets consisting mainly of ice.

Parallax—The apparent displacement of an object, as seen from two different points.

Photosphere—The luminous envelope of the sun.

Planetoid—A body resembling a planet.

Proselenes—Men living before the capture of the present moon.

Protuberance—Outbreak of glowing masses from the sun.

Revolution—The turning of a heavenly body around its central point.

Rotation—The turning of a heavenly body around its axis.

Sidereal—Relating to the stars.

Solifugal—In motion away from the sun.

Solipetal—In motion toward the sun.

Specific Gravity—Weight of matter in proportion to a corresponding amount of water, whose specific weight equals 1.

Zenith—The point in the sky perpendicular above the observer.

DEFINITIONS

Calory—A unit of heat, corresponding to the quality of heat required to raise one degree centigrade the temperature of a given volume of water.

Inertia—That property of matter by which it tends to remain in an existing state of rest or motion in the same straight line and direction, unless acted upon by an exterior force.

Loess—A finely comminuted loam or sand of a yellowish-gray colour in some places hundreds of feet thick.

NOTES

NOTE NO. 1

If for instance, such an ice block of 300 feet diameter breaks up into small pieces ½ inch in size, about one thousand millions of fragments will form. These naturally meet a greater resistance in the air than will the single block. Hoerbiger makes the following calculation: A sphere of 100 meters diameter contains one thousand million spheres, each 1 cm. in size; it contains on the other hand 526.6 billions $cm.^3$ But such a block will never break into small spheres of 1 $cm.^3$, nor into grains 1 cm. in size—the first 526.6 billions, the last one trillion in number. But let us suppose that it broke into square fragments each 1 $cm.^3$ in size and that the corners and edges, during the fall and process of melting into spherical shape, turned into water. We would have an ice mass of altogether 526.6 billions $cm.^3$, 277.2 billions $cm.^3$ of hailstones and 249.4 billions $cm.^3$ of rain water. If this is distributed over a hailstorm area so that hail and water are 5 cm. high, we have an area of 10.472 $km.^2$ or of 10 km. in length and 1.047 in width—which fits in with the results of such catastrophes of which we have knowledge.

NOTE NO. 2

In order to change 1 kg. snow or ice of 0°C. into water of 0°C. 80 kg.–cal. are required: This is the heat of fusion or latent heat of water. To raise the temperature of this water from 0° to 1° one calory has to be supplied (equal to the specific heat of water) and to heat it to 100° C. one hundred calories are necessary. To change this water of 100° into steam of the same temperature under normal air pressure 540 kg.–cal. must be supplied which is the heat of evaporation. For each 1 kg. of ice of 0° $80 + 100 + 540 = 720$ kg.–cal. are therefore required from the beginning of melting to complete change into steam; in a vacuum, this amount would be reduced to about 600 calories.

However, it is known that the entire amount of water can not be changed into steam in a vacuum because at a pressure of 4.6 mm. mercury gage and a temperature of the water of 0° the latter will evaporate, but only 13% of the water turns into vapor and the rest solidifies to ice. A further reduction of the pressure will vaporize another fraction of this ice but that also ceases when the temperature has dropped to — 40° C. and no additional heat is supplied from the outside.

These facts must be considered in the question of lunar ice, for that could be evaporated only if by an exterior heat supply its temperature can be raised to over — 40°; whether this is possible the following considerations will show.

The amount of heat radiated by the sun upon 1 square meter of black surface is assumed to be 20 calories per minute; this is called the solar constant. As the distance of the Earth and that of the Moon from the sun are not appreciably different the same solar constant can be applied to both, i.e., 1 $m.^2$ on the moon also receives 20 cal. from the sun every minute, provided the radiation takes place under an angle of 90°. But this is true only for those parts of the moon's surface which have noon at the time. In following a square meter of the lunar surface from its appearance out of the lunar night until its disappearance again (which takes about half a month or 21,262 minutes) the radiation is zero at the beginning, reaches its maximum and decreases again to zero. Mathematics teaches that the radiation on the surface inclined against the vertical follows the sine law; that means that instead of having for the total radiation impinging on the moon the simple product of 20 cal. × 21,262 min., this must still be multiplied with a factor taking the sinusoidal change of the radiation into account; for the area of the sine curve this factor is 0.637. The total radiation on a square meter surface during its passage before the sun is therefore $20 \times 21{,}262 \times 0.637 = 270{,}878$ or in round figures 270,000 kg.-cal. This amount would be available for heating the ice under the assumption that we have to deal with a black surface and nothing is reflected.

But the surface of the moon shows almost white areas and also considerably dark ones; the latter conduct heat into the interior while the former will reflect most of it. Let us take the reflection as 25% and the radiation of the daylight side of the moon as 15% of the entire irradiation, there remains 60% of the above 270,000 or about 160,000 cal. which have been absorbed from the beginning of the lunar day to its end by a square meter of lunar surface. To what temperature now could this amount of heat raise the ice which has perhaps an average thickness of 10 to 15 meter at an average temperature of — 250° C.?

One $m.^2$ and 10 m. depth form an ice block of 10 cubic meter or 10,000 kg. We saw before that 720 cal. are required to transform 1 kg. ice into steam; for 10,000 kg., 7,200,000 cal. would be necessary, and we have only 160,000 at our disposal which means that for each kg. 160000/10000 = 16 cal. are available; that would raise the whole block 16°. And if we assume that the radiation penetrates 1 m. only instead of 10 m. the temperature increase would amount to 160° which brings the temperature of the upper layer from — 250° to — 90° which is still colder than the — 40° required before evaporation can set in. It is therefore impossible that under the present radiation from the sun the ice on the moon will melt to any considerable extent.

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